Business Taxation in Ontario

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Edited by Allan M. Maslove

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Foreword

The Ontario Fair Tax Commission was established to examine the province's tax system as an integrated whole and, in conjunction with its working groups, to analyse individual components of the system in detail.

It has been many years since the Ontario tax system was subjected to a comprehensive examination. However, a great deal of research on taxation has been undertaken over the past two decades. This work, based in several disciplines, has been both theoretical and applied, and in this context the research program of the Fair Tax Commission was formulated.

The research program has two broad purposes. The first is, of course, to support the deliberations of the commissioners. The second, more novel objective is to inform public discussions of tax matters so that the commission's formal and informal public consultations can be of maximum value. For this reason we have opted to publish volumes in the series of studies as they are ready, rather than holding them all until the commission has completed its work. While our approach is more difficult from a technical and administrative perspective, we believe that the benefits will justify our decision.

The research program seeks to synthesize the existing published work on taxation; to investigate the implications for Ontario of the general research work; and, where required, to conduct original research on the context and principles for tax reform and on specific tax questions. We thus hope to add to the existing body of knowledge without duplicating it. The studies included in these publications are those that we believe make a contribution to the literature on taxation.

I would like to extend my thanks to my fellow commissioners and to the members of the FTC secretariat. I also thank the many members of the working groups and the advisory groups who have contributed to the research program and to the overall work of the commission.

Monica Townson, Chair

Introduction

The papers in this volume examine major taxes paid by businesses in Ontario, including corporate income and capital taxes, and payroll taxes paid by employers. (The remaining major taxes paid by business are the non-residential property tax and the business occupancy tax. These are treated in a paper included in a forthcoming volume on local government tax issues.) In 1991–92, the Ontario government's combined revenues from the corporate income and capital taxes amounted to $3.2 billion. The Employer Health Tax, the principal payroll tax levied by the Ontario government, generated a revenue of $2.6 billion. Together, these taxes accounted for 13 per cent of provincial revenues in 1991–92.

Debates about these taxes have been highly charged. It is argued, on the one hand, that these taxes drive business and investment (and the employment they create) out of the province, and, on the other, that business is not paying its "fair share." The papers in this volume examine tax levels faced by firms in Ontario, assess these levels relative to those in other jurisdictions, and discuss what impacts they may have on business-investment behaviour.

Chen and Mintz consider the impact of corporate income taxes, the Ontario capital tax, and the Ontario mining tax on various industries and types of investment. They calculate effective tax rates on capital for marginal investments in 10 industries for 5 groups of assets. Their findings suggest that Ontario is a relatively high-tax jurisdiction compared with other provinces but is generally not out of line. Effective tax rates in the Atlantic provinces are notably lower because of the federal investment tax credit, and rates are low in Alberta as a result

of its large oil and gas revenues. Of more significance is the variation in effective marginal tax rates within Ontario, across both industries and asset types. This variation raises questions about whether these non-neutral tax burdens continue to reflect valid public-policy purposes, and whether, in general, it would be preferable to make the tax system more neutral in its impact.

Sabourin, Gribble, and Wolfson estimate average effective tax rates, using data from a large sample of corporate tax returns. Their methodology is thus quite different from that of Chen and Mintz, but, where comparable, the two sets of results are broadly consistent. For example, the analysis of tax returns confirms that effective rates vary substantially across industries. Sabourin and colleagues also demonstrate that effective rates are higher for mid-size corporations and lower for small and large firms.

Whereas Chen and Mintz simulate marginal tax rates facing full tax–paying firms, Sabourin, Gribble, and Wolfson show that, in actual fact, a substantial portion of corporations with positive income (defined as benchmark income in their analysis) do not pay any tax. The data available for this analysis predate the federal tax reforms of 1987. The authors note that there is reason to believe that the reforms increased effective corporate tax rates, although confirmation is not possible at this stage: the impacts of tax reform are difficult to disentangle from those of the recent recession on corporate profits, given the aggregate statistics available.

Payroll taxes are the subject of the third paper in this volume. The federal and provincial governments in Canada are generally much less reliant on payroll taxes (as proportions of total revenues) than are other industrialized countries. Dahlby explores the issues of the incidence of payroll taxes and the consequences for efficiency of raising revenues from payroll taxes. Following an excellent review of the literature on the incidence of payroll taxes, Dahlby concludes that at least 80 per cent of the tax is ultimately borne by labour. He also explores the graduated rate structure of the tax and argues that it can create strong disincentives for hiring by small businesses. He finds that the efficiency costs of raising additional revenues from payroll taxes may be lower than for taxes on income from capital, but speculates that sales taxes may be still more favourable on this score.

The final paper, by Ernst & Young, reviews the research studies that have been conducted on the impact of taxes on business-location decisions, returning us to the argument that business taxes may drive away investment. The studies surveyed appear to allow us to conclude

that tax levels by themselves are probably less significant in influencing such decisions than are several other variables (e.g., quality of the labour force and quality of public services purchased with the tax revenues), and certainly less important than the ancedotal evidence seems to suggest.

While these studies tend to accord only moderate importance to tax variables, they take their observations from situations in which business tax burdens are roughly comparable. Therefore, it may be the case that if one jurisdiction were to move substantially away from its competitors in such situations, major investment-location consequences would ensue. Stating the point somewhat differently: at the margin, investment location may still be quite sensitive to taxation.

The studies in this volume provide important insights into the taxes they examine. Equally important, they shed light on the constraints that a jurisdiction faces when it considers reforms to the system of business taxation.

Allan M. Maslove

Business Taxation in Ontario

1 Taxation of Capital in Ontario and Canada

An Interindustry and Interprovincial Comparison

DUANJIE CHEN and JACK MINTZ

The competitiveness of tax policy is now an overriding concern of many policy makers in a world of increased capital mobility. One of the issues often faced by a government is whether its jurisdiction has the necessary competitive advantage over neighbouring jurisdictions to attract capital investments. Whereas a high tax on capital may deter capital investments, encouraging producers to undertake projects elsewhere, a low rate of tax may make a region more competitive relative to others.

We emphasize, at the outset, that taxation is only one of many factors that affect investment. Investment depends on profitability, which, in turn, depends on many factors besides taxation. A short list of economic factors includes the availability of labour (both skilled and unskilled), infrastructure, and natural resources; the cost of using inputs in production; and the size of the market. Political factors that impact on investment decisions include the stability of a government. Thus, the decision to invest in a particular jurisdiction depends on many factors other than taxation.

This study examines one of the determinants of investment, namely, the impact of taxation on the cost of capital. No attempt is made here to determine how much the cost of capital affects investment. Instead, the following analysis examines the structure of effective corporate tax rates across industries and capital types in both Ontario and other provinces of Canada. The methodology follows the effective tax-rate analysis initiated by King and Fullerton (1984) and Boadway, Bruce, and Mintz (1984). This methodology has been used to analyse the impact of tax reform in Canada in works such as those by Daly and Jung (1987) and Jog and Mintz (1989).

As a caveat, we emphasize that we deal with the impact of taxation on only the cost of capital, not on the cost of the firm's production. The production decisions in different jurisdictions depend not only on the taxation of capital inputs, but also on other factors of production, such as labour, fuel, and land.[1] Here, we examine one part of the tax system that influences the cost of one factor of production. Our results are indicative of how tax systems impact on the use of capital in production.

Background

The treatment of capital under the corporate tax is a source of distortion in the pattern of investment in Canada. Effective tax rates on corporate capital vary widely, depending on the types of investment, the method of finance, and the industry and location in which the investment is made. In this study, we examine two types of distortions. First, we consider the impact of federal and provincial corporate income and capital taxes on the use of assets by industry in Ontario. We measure not only the effective tax rate on capital by asset and industry, but also a dispersion index of effective tax rates in Ontario. Second, we measure the effective tax rate under federal and provincial corporate income and capital tax systems for all provinces in Canada. Aggregate effective tax rates and dispersion indices are calculated for each province and compared.

The effective tax rate (t) is a summary measure of the impact of corporate tax provisions (statutory tax rates and permitted deductions for depreciation, inventory costs, interest, etc.) on the profitability of investment projects. In principle, investment occurs until the net-of-tax return on the incremental use of capital is equal to the cost of acquiring capital from the market. The effective tax rate is thus computed by calculating the amount of tax paid on profits earned on the last or marginal unit of capital held by the firm. The effective tax rate is measured as the difference between the gross (before-tax) rate of return on the marginal investment project and the net (after-tax) rate of return on the savings used to finance that investment.

It is important to note that "the effective tax rate" refers only to the rate at which a marginal investment project is taxed such that its revenues just cover tax-inclusive costs. Given an inverse relation between investment and the rate of return on capital, the rate of return on an inframarginal project probably will be higher than that on a marginal project. Therefore, an average tax rate, measured as total

tax paid as a percentage of profits, will overstate the tax burden since inframarginal returns are taxed more heavily.[2] Thus, the methodology used here differs from project analysis which assumes that the internal rate of return on a project is greater than the marginal return. For the purpose of determining the impact of taxation on the cost of capital, which is relevant to investment decisions, the marginal effective tax rate should be computed.

Our study is based on the following assumptions:

1. Given the freedom with which financial capital can move across Canadian borders, and the fact that Canada is a small participant in the financial capital markets of the world, it is reasonable to view Canada as a price taker on world capital markets, so that changes in investment or savings behaviour in Canada do not affect the rate of return, or interest rate payable to international investors.[3] In other words, the investment decisions of Canadian firms are affected only by the provisions of the corporate tax system, unlike the savings decisions of households, which are influenced only by the personal tax system. The total effective tax can thus be divided into two parts: the effective corporate tax and the effective personal tax. The former is the difference between the before-tax rate of return on marginal investment and the interest rate on world capital markets. The latter is the difference between the interest rate on world capital markets and the after-tax rate of return on the domestic saving.
2. Despite the fact that, separate from the federal government, Alberta, Ontario, and Quebec have corporate income tax (CIT) systems, their bases are similar to those of the other provinces, and adhere to the same allocation rule. Therefore, in the empirical analysis, we need take account of only a few major tax provisions at the provincial level. The most important provision at the provincial level is the statutory tax rate. In measuring the effective tax rate, we also take into account capital taxes. The incorporation of capital taxes is based on new theoretical methodology developed for this paper.
3. The allocation rule used for attributing taxable income or capital across provinces can have some special tax impacts on the cost of capital. For example, companies may try to shift revenues or payroll costs to jurisdictions with low statutory corporate tax rates to generate more taxable income in these jurisdictions. If such jurisdictional shifts occur, the capital decision (and the effective tax

rate) is affected. In our calculations below, we do not attempt to incorporate the impact of the allocation rule on the effective tax rates.

4. We consider only the case of fully taxable firms facing risky revenue streams. Riskiness in terms of capital good prices and economic depreciation is ignored.[4] We see this case as the base from which we could expand the analysis to other cases by incorporating any other possible factors, such as capital risk, tax losses, various forms of financial arbitrage, and foreign-controlled companies.[5] Cases other than the base case are not developed in this paper as they would not change qualitative results.
5. For a given industry, the capital structure and debt/asset ratio are assumed to be the same across the provinces. This assumption results from a lack of data that would otherwise permit us to measure capital structures and debt/asset ratios that vary by province.[6] Debt/asset ratios do vary by industry, although we consider a simulation that forces the debt/asset ratio to be the same across all firms.

The main tax and non-tax factors to be considered in our study are the following:

- the variation in statutory corporate tax rates across firm sizes and industries;
- the variation in financing method measured by debt/asset ratios across industries;
- the difference in capital structure across industries;
- the differential impact of the federal investment tax credit (ITC) and provincial capital taxes; and
- the difference in industrial structure across provinces.

The Interindustry Comparison

Our analysis measures the interindustry distortion induced by the corporate tax system by comparing the effective corporate tax rates for industries and assets in Ontario. We then undertake a similar analysis for the other provinces, although we report only more aggregated statistics.

Tables A.1 to A.7 are presented in Appendix B. Other tables are reproduced in the body of the paper.

Interindustry Effective Tax Rates

As is well known, besides the statutory tax rates, the extent to which the corporate tax favours one industry over another depends upon each industry's leverage, capital structure, and tax provisions such as tax depreciation allowances, inventory cost write-offs, and investment tax credits.

Table 1 presents our calculations of the Ontario effective corporate tax rates for the year 1991. Effective tax rates are estimated for "large" (l), "small" (s), and "combined" (c) companies, 10 industries, and 33 assets (aggregated asset classes include structures, machinery, inventories, and land). Estimates of effective tax rates for the mining industry include mining profit taxes in addition to the corporate income and capital tax.

From table 1, we see that agriculture, fishing, and forestry (A, F, & F), and service industries are the most-favoured industries in Ontario, whereas construction and wholesale trade are the least favoured. Behind these numbers, we find the following to be the case:

1. In Ontario, agriculture, fishing, and forestry, and the manufacturing industry are favoured by a one-point reduction in provincial corporate tax rate. A further 30 per cent of the cost of investment in machinery and equipment is deducted for Ontario provincial tax purposes (see table A.1), although this deduction, except in the case of pollution-control equipment, was eliminated in 1992.
2. Furthermore, agriculture, fishing, and forestry use cash accounting for inventories. Equivalent to the expensing of inventory investment for tax purposes, such cash accounting produces a significant benefit since it reduces the overall effective tax rate for agriculture, fishing, and forestry.
3. The construction industry has the lowest debt/asset ratio, and is therefore not able to deduct as much interest expense (unadjusted for inflation) from corporate taxable income. As will be shown below, for this reason the construction industry has the highest effective tax rate among industries (see table A.2).
4. Owing to first-in first-out (FIFO) treatment of accounting costs, inventories are the highest-taxed form of capital across all industries except for agriculture, fishing, and forestry (see table 1). The service industry has a negligible amount of inventories (refer to table A.3a). This is one of the major reasons for the service industry having a

TABLE 1
Ontario Effective Corporate Tax Rate by Industry and Capital Type (1991)

	Land	Bldg	Machin	Invent	E & D	Aggreg
Combined						
A, F, & F	12.15	15.94	13.81	−17.44		11.11
Mfg	17.18	22.93	20.61	45.97		30.12
Const	16.77	22.52	31.68	41.21		34.50
Tr & St	−2.76	10.28	26.09	41.35		18.67
Comm	1.30	21.51	7.98	45.47		16.33
Pub Utl	8.05	14.86	15.40	48.06		17.30
Ws Trade	9.48	15.17	22.02	41.34		30.19
Rt Trade	5.72	4.83	18.92	36.32		22.72
Service	2.15	6.68	22.95	33.11		14.74
Mining	8.39	5.37	−62.74	55.13	−110.48	−34.34
Aggregate	10.38	17.27	17.96	43.30	−110.48	24.55
Large						
A, F, & F	25.18	35.73	31.07	−34.31		25.83
Mfg	18.42	25.13	21.76	48.06		31.84
Const	26.83	34.75	46.54	55.94		49.14
Tr & St	−3.14	12.35	30.94	44.27		22.68
Comm	1.32	22.05	8.18	45.86		16.75
Pub Utl	8.14	21.66	15.88	48.37		17.93
Ws Trade	13.11	22.82	29.84	50.28		38.75
Rt Trade	9.42	7.66	29.83	48.86		33.21
Service	2.15	6.68	22.95	33.11		24.16
Mining	8.39	5.37	−62.74	55.13	−110.48	−34.34
Aggregate	13.43	21.18	19.88	48.70	−110.48	28.23
Small						
A, F, &F	10.71	13.87	11.88	−15.71		9.62
Mfg	8.68	9.11	8.39	29.08		16.30
Const	11.22	14.26	23.02	30.92		25.09
Tr & St	−1.94	1.76	0.77	21.46		2.09
Comm	−0.30	2.71	−1.07	22.63		1.23
Pub Utl	2.40	10.97	10.97	24.56		10.97
Ws Trade	4.52	6.07	11.19	26.08		17.22
Rt Trade	2.93	3.04	10.76	24.94		14.46
Service	0.79	3.25	15.58	23.40		9.23
Mining	N/A	N/A	N/A	N/A	N/A	N/A
Aggregate	6.68	5.70	12.28	25.93	N/A	13.81

Dispersion	Overall	24.05
	Asset	12.19
	Industry	11.99

lower effective tax rate. Some industries, particularly manufacturing, that are taxed at a lower statutory tax rate (table A.1) have higher effective tax rates because of the use of high-taxed inventories. Moreover, inventory weights in wholesale trade and construction are highest among all industries, which is another major contributor to their having the least-favoured position.

5. Besides the mining and retail trade industries, the agriculture, fishing, and forestry, and service industries are favoured by generous write-offs for tax depreciation (see table A.4), which are allowed for building and machinery assets. Considering that these two types of assets account for more than 77 per cent of the capital in the service industry, the resulting low effective tax rate for that service industry is not surprising.

Given the assumptions of the same debt/asset ratio, capital structure, and the similar tax depreciation allowances for an industry across all provinces, the above analysis, except for point 1, is essentially applicable to other provinces. In general, construction and wholesale trade are the least-favoured industries, while agriculture, fishing and forestry, and the service industry are the most favoured (see table 2 below).

Nonetheless, a different conclusion is reached regarding interindustry comparisons when one considers the aggregate, combined effective tax rate by industry. Companies claiming the small-business tax deduction are able to enjoy a preferential tax treatment under corporate tax law. Thus, industries with a sizeable small-business sector face a lower effective tax rate. The combined effective tax rate takes into account the composition of assets held by large and small firms in each industry (few companies qualify for the small-business deduction in the mining industry or utility sector, and only a small portion of capital is held by small companies in the manufacturing industry). For example, even though the effective tax rates, in terms of "large" and "small" numbers, are higher in the construction and wholesale trade industries than in other industries, the combined effective tax rates are lower in 1991 for these two industries compared with those for the manufacturing industry in provinces other than Ontario and those in the Atlantic region. The situation in Ontario is different owing to the provincial preferential treatment – discontinued in 1992 – given to the manufacturing industry. In the Atlantic region, a much lower effective tax rate results from the federal investment tax credit (15 per cent of qualifying investments in machinery and

TABLE 2
Structure of Canadian Effective Corporate Tax Rates Across Provinces (1991) (including mining industry)

		BC	Alta[a]	Sask[b]	Man	Ont	Que	NB	NS[c]	PEI[d]	Nfld
A, F, & F	C	12.1	10.6	13.0	13.2	11.1	9.4	3.4	4.0	3.9	4.1
	L	27.6	28.1	30.0	31.7	25.8	24.3	21.1	20.1	19.1	21.1
	S	10.6	8.9	11.2	11.2	9.6	7.7	2.0	2.6	2.6	2.6
Mfg	C	32.1	32.1	34.9	36.5	30.1	28.5	21.9	20.9	19.8	22.0
	L	34.0	34.4	36.9	38.7	31.8	30.3	24.4	23.1	21.8	24.4
	S	17.9	15.3	18.8	18.8	16.3	13.4	3.5	4.7	4.7	4.7
Const	C	32.8	31.0	34.9	35.6	34.5	28.0	32.0	32.2	31.8	32.7
	L	47.3	47.8	49.5	51.4	49.1	42.3	47.5	46.4	45.3	47.5
	S	24.0	20.8	25.1	25.1	25.1	18.3	22.4	23.6	23.6	23.6
Tr & St	C	16.3	16.3	19.7	20.7	18.7	15.8	10.9	10.3	9.6	11.0
	L	20.2	20.6	23.7	25.1	22.7	19.2	15.5	14.6	13.7	15.5
	S	1.9	1.4	2.1	2.1	2.1	1.1	−2.0	−1.8	−1.8	−1.8
Comm	C	14.0	14.2	17.4	18.5	16.3	13.8	15.1	14.5	13.9	15.1
	L	14.4	14.7	17.8	19.0	16.7	14.1	15.6	14.9	14.3	15.6
	S	1.1	0.7	1.2	1.2	1.2	0.5	0.1	0.2	0.2	0.2
Pub Utl	C	15.1	15.4	18.2	19.4	17.3	14.4	15.5	14.8	14.1	15.5
	L	15.7	16.0	18.8	20.1	17.9	14.9	16.2	15.4	14.8	16.2
	S	10.4	8.7	11.0	11.0	11.0	7.5	9.4	10.0	10.0	10.0
Ws Trade	C	28.2	27.4	30.8	31.8	30.2	25.0	27.5	27.3	26.7	27.9
	L	36.6	37.0	39.4	41.2	38.8	32.9	36.9	35.8	34.8	36.9
	S	16.4	14.0	17.2	17.2	17.2	12.2	14.3	15.2	15.2	15.2

Rt Trade	C	21.0	19.9	23.3	24.0	22.7	18.4	21.2	21.2	20.9	21.6
	L	30.8	31.3	34.0	35.7	33.2	28.1	32.4	21.5	30.5	32.4
	S	13.7	11.6	14.5	14.5	14.5	10.1	12.9	13.7	13.7	13.7
Service	C	13.3	12.3	15.3	15.7	14.7	11.8	9.7	9.8	9.6	10.1
	L	22.0	22.4	25.0	26.4	24.2	20.1	20.3	19.5	18.6	20.3
	S	8.7	7.3	9.3	9.2	9.2	6.2	3.9	4.4	4.4	4.4
Mining	C	−11.6	−16.0	N/A	−85.4	−34.3	−26.8	−96.7	N/A	N/A	−88.9
	L	−11.6	−16.0	N/A	−85.4	−34.3	−26.8	−96.7	N/A	N/A	−88.9
	S	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Agg	C	20.7	17.0	22.1	23.0	24.5	21.0	10.3	18.8	16.5	5.4
	L	23.9	20.6	29.6	27.5	28.2	24.6	12.4	23.5	23.9	6.2
	S	13.7	12.0	12.9	13.5	13.8	10.0	9.7	10.1	8.1	9.8
Dispersion											
Overall		34.0	38.7	13.0	58.3	24.1	21.7	74.9	16.6	17.2	76.2
Asset		11.4	11.9	10.2	14.1	12.2	9.1	24.7	14.4	14.3	24.2
Industry		9.6	10.2	8.7	25.5	12.0	8.3	37.4	8.3	7.9	37.4

a. The aggregate number for Alberta does not include the oil and gas industry, which we do not consider here, but accounts for more than 50 per cent of total capital stock in this province.
b. For Saskatchewan we have not modelled the new mining taxation rules.
c. The aggregate number for Nova Scotia does not include the mining industry, given its small capital stock in this province.
d. There is no mining industry in PEI.

structures) applied to primary, resource, manufacturing, and transportation industries (see table A.5).

As shown in table 1, the dispersion index (the standard deviation from the mean of the weighted differences in effective tax rates) is calculated for all effective tax rates across all industries and assets; across industries (measuring the dispersion of industry effective tax rates around the aggregate effective tax rate across industries); and across assets (measuring the dispersion in effective tax rates on assets within each industry). A standard deviation of 24.1 per cent, as indicated in table 1, is roughly equal to the aggregate effective tax rate of 24.6 per cent. We see that the variation in effective tax rates across both assets and industries contributes equally to the degree of variation in the effective tax rates on capital.

Interasset Comparisons

The interasset differences in effective tax rates arise from the differential corporate tax treatment of assets and the lack of indexation for inflation.

Table 1 shows that inventories are the most highly taxed asset and land the least-taxed asset for most industries. The major reasons are the following:

1. Land used in production is taxed at a very low rate because interest deductions, unadjusted for inflation, provide a significant tax subsidy for the holding of leveraged assets.
2. Inventories are taxed at the highest effective rate. This situtation arises out of the deductibility of the historical cost of inventories during inflationary periods, given the requirement that firms must use the FIFO method to value inventories. The use of FIFO implies that the costs of inventories are deducted at the original cost (i.e., when an item is removed from inventory, it is valued for tax purposes at the cost of the oldest item introduced in the inventory). Therefore, the deduction for the inventory item is less than its replacement cost in times of rising prices. The tax deduction is thus less than the true imputed cost for holding the inventory, which gives rise to the taxation of inflationary inventory profits.
3. Only in the case of agriculture, fishing, and forestry is the effective tax rate on inventories negative. This result is attributable to the use of cash accounting for inventories permitted for these industries. When companies use cash accounting, they are able to ex-

pense the cost of inventories as well as deduct any interest costs incurred in financing inventories. Both the expensing of inventories and the deductibility of interest costs provide a tax write-off that is more than the economic cost of holding inventories.

We undertake a similar set of calculations for 1992 (see table 3). In 1992, we assume a lower rate of inflation (3 per cent) and incorporate federal and Ontario budget changes. The primary budgetary change at the federal level was the reduction in the manufacturing corporate tax rate. A similar reduction took place in Ontario, but Ontario also eliminated the 15 per cent deduction for manufacturing and other qualifying machinery investments.

When the inflation rate is 3 rather than 5 per cent (as was the case in 1992), the variation in tax rates, as measured by the dispersion index across assets and industries, is reduced in 1992 compared with 1991. Land is taxed at a higher rate, since firms would benefit less from the corporate tax subsidy associated with nominal debt-interest deductions. Also, inventories are less highly taxed under lower inflation, since the corporate tax recognizes for valuation purposes only the original cost rather than the replacement cost of inventories.

In table 4, we report some simulations of 1992 effective tax rates for different cases. The exclusion of the mining industry has a noticeable impact in reducing the dispersion of effective tax rates from calculations. This effect is not surprising since mining assets are taxed at quite different rates, given the special treatment afforded under the mining and corporate income tax laws.

We measure effective tax rates for the following cases:

1. assuming the Ontario distribution of capital across industries is the same as the average of the national structure;
2. assuming the same debt/asset ratio across industries;
3. assuming an inflation rate of 5 per cent (and higher nominal interest rates assuming purchasing power-parity conditions for international financial arbitrage) with different debt/asset ratios across industries; and
4. assuming the same as in case 3, above, with the same debt/asset ratio across industries.

We note that a different capital structure across industries, which implies less weight in manufacturing and more weight in other industries such as agriculture and fishing and forestry, would suggest

TABLE 3
Ontario Effective Corporate Tax Rate by Industry and Capital Type (1992)

	Land	Bldg	Machin	Invent	E & D	Aggreg
Combined						
A, F, & F	15.51	18.46	17.77	−13.02		14.50
Mfg	21.93	25.52	22.44	38.53		28.41
Const	20.77	22.64	28.05	35.40		30.45
Tr & Stor	12.13	15.13	26.20	36.19		21.14
Comm	15.88	26.08	10.73	40.08		20.53
Pub Utl	20.02	18.50	18.54	42.48		19.81
Ws Trade	17.44	17.42	19.94	35.86		27.67
Rt Trade	13.59	7.72	17.68	31.19		21.11
Service	10.65	9.93	21.07	28.29		15.78
Mining	4.65	6.74	−59.03	53.30	−119.07	−35.62
Aggregate	16.67	20.56	19.12	36.78	−119.07	23.73
Large						
A, F, & F	30.88	37.99	34.34	−24.63		30.35
Mfg	23.29	27.54	23.47	40.36		29.92
Const	32.32	34.81	41.98	49.90		44.49
Tr & Stor	13.46	18.02	30.86	39.00		24.94
Comm	16.08	26.64	10.93	40.46		20.97
Pub Utl	20.22	25.09	18.99	42.79		20.40
Ws Trade	23.32	25.35	27.04	44.57		35.92
Rt Trade	21.01	11.76	27.84	43.24		31.10
Service	10.65	9.93	21.07	28.29		25.35
Mining	4.65	6.74	−59.03	53.30	−119.07	−35.62
Aggregate	21.74	24.55	21.03	41.84	−119.07	27.16
Small						
A, F, & F	13.75	16.36	15.89	−11.78		12.78
Mfg	12.24	12.36	12.06	24.21		16.38
Const	14.12	14.32	20.14	25.77		21.69
Tr & Stor	4.46	4.68	2.10	17.78		4.51
Comm	5.65	5.28	0.79	18.76		3.53
Pub Utl	7.62	12.98	12.98	20.39		12.98
Ws Trade	9.17	7.61	10.14	21.67		15.40
Rt Trade	8.01	4.98	10.08	20.71		13.31
Service	6.44	5.59	14.17	19.42		10.02
Mining	N/A	N/A	N/A	N/A	N/A	N/A
Aggregate	10.76	8.12	12.95	21.50	N/A	13.73

Dispersion	Overall	22.52
	Asset	8.36
	Industry	11.13

TABLE 4
Sensitivity Analysis: Effective Corporate Tax Rate in Ontario, 1992

	Base	Case 1	Case 2	Case 3	Case 4
By asset type					
Land	16.74	16.27	13.86	11.15	7.22
Bldg	20.60	19.94	19.27	18.29	16.59
Machin	21.79	21.61	19.30	22.71	19.68
Invent	36.37	35.81	33.41	40.98	37.69
By industry					
A, F, & F	14.50	14.50	8.23	13.06	5.04
Mfg	28.41	28.41	23.14	30.40	24.11
Const	30.45	30.45	23.86	33.70	26.02
Tr & Stor	21.14	21.14	26.72	18.67	25.72
Comm	20.53	20.53	24.66	16.57	21.97
Pub Utl	19.81	19.81	20.53	17.19	18.13
Ws Trade	27.67	27.67	26.20	29.64	27.90
Rt Trade	21.11	21.11	21.11	22.40	22.40
Service	15.78	15.78	17.75	14.68	17.12
Aggregate	25.19	24.47	22.84	26.11	23.26
Dispersion					
Overall	8.56	8.07	8.47	11.41	10.79
Industry	6.95	6.00	7.23	9.25	9.72
Asset	4.95	4.60	4.99	5.83	5.15

Note:
1. Base with inflation rate = 0.03 and debt/asset ratio different across industry
2. Case 1 with the capital structure by industry same as national structure
3. Case 2 with the inflation rate = 0.03 and debt/asset ratio constant across industry
4. Case 3 with inflation rate = 0.05 and debt/asset ratio different across industry
5. Case 4 with inflation rate = 0.05 and debt/asset ratio constant across industry

that Ontario would have a slightly lower effective tax rate (and a dispersion in effective tax rates). This finding is not surprising since manufacturing is more highly taxed than the average industry.

If debt/asset ratios were forced to be the same across industries, we would find a significant reduction in the effective tax rate on capital, although the dispersion in effective tax rates would remain about the same. Effective tax rates fall with more leverage since interest deductions shield companies from paying corporate tax. The primary reduction in effective tax rates occurs in the otherwise low-leveraged industries: agriculture, fishing, and forestry; manufacturing; and construction. The most significant increase in effective tax rates would be in transport and storage, which is otherwise highly leveraged.

Finally, inflation causes the aggregate effective tax rate to rise slightly in Ontario by about a percentage point (compare Base with case 3, and case 3 with case 4). It is useful to keep this point in mind since the Bank of Canada's commitment to zero inflation would lead to a reduction in the effective tax rate on Ontario capital compared with a situation of inflation with rates equal to 3 or 5 per cent.

The Interprovincial Comparison

The results on interindustry and interasset comparisons for Ontario and each of the provinces discussed above are not novel; rather, they are in keeping with results obtained earlier by Jog and Mintz (1989) and Daly and Jung (1987). Of more importance is the interprovincial comparison that incorporates not only differences in corporate income tax provisions, but also the capital and mining tax that vary in application across provinces. These values are reported in table 2.

Since the mining industry is subsidized at the margin, and tax policy varies significantly from province to province, it would be useful to consider an interprovincial comparison of effective tax rates that deletes the mining industry. With this exclusion, table 5 provides effective tax rates on large, small, and combined firms by industry and province.

Preliminary Comparison: Aggregate Effective Tax Rates in 1991

Our first observation is that, when mining is included, Ontario has the highest effective tax rate (ETR) on capital in 1991, and the second highest when mining is excluded. When mining is included, Ontario's ETR on capital is 25.6 per cent in aggregate. The next-highest is Manitoba's, at 23.0 per cent.

When mining is excluded, Ontario's 1991 combined aggregate ETR is 26 per cent, which is only slightly lower than Manitoba's (26.8 per cent). We note that Manitoba's provincial corporate income tax rate is higher than Ontario's (1.5 points higher in general, and 2.5 points higher in the agriculture, fishing and forestry, and manufacturing industries), and its capital tax rate on non-financial firms is 0.2 percentage points higher than Ontario's. The high 1991 ETR in Ontario results from the high capital weight for manufacturing, which, as we mentioned above, is one of the most highly taxed industries. (See table A.6 for statutory tax rates, and table A.3b for the industrial structure across provinces.)

Second, the four Atlantic provinces show the lowest aggregate 1991

ETRs among the provinces, despite the fact that the statutory provincial tax rates in New Brunswick and Newfoundland are as high as in Manitoba, and the share of capital held by manufacturing in Nova Scotia is the third highest, following Ontario and Quebec, among all provinces. The low effective tax rates in the Atlantic provinces primarily result from the federal investment tax credit that is now restricted to qualifying primary resource manufacturing and transportation investment in the Atlantic provinces and the East Coast areas of Quebec.

Third, British Columbia's statutory tax rate is roughly the same as those in Alberta and Saskatchewan. However, the three highest-taxed industries (e.g., manufacturing, construction, and wholesale trade) account for a greater share of capital in British Columbia compared with Alberta or Saskatchewan.[7] Therefore, British Columbia is the third-highest-taxed province in Canada when mining is excluded.[8]

Fourth, following British Columbia, Quebec's combined 1991 ETR is also higher than Alberta's and Saskatchewan's, although Quebec's statutory provincial tax rate is the lowest in Canada (about 6 per cent in 1991) and significantly lower than that of any other province. Quebec's aggregate ETR is similar to Ontario's because of two factors. First, Quebec's manufacturing industry accounts for 41.5 per cent of the provincial capital stock, while manufacturing is one of the highest-taxed industries. Second, Quebec's capital tax applies to both large and small companies and is the highest among all provinces in terms of its statutory tax rate.

Variability of Effective Tax Rates in 1991

Tables 2 and 5 also show, for all provinces, the overall dispersion, interindustry dispersion, and interasset dispersion of effective tax rates measured by the standard deviation of effective tax rates. Tables 6a and 6b provide aggregated ETR measures by asset type. By comparing these numbers, one can compare the magnitude of interindustry and interasset distortions for the provinces. We first discuss dispersion indices for the case in which mining is excluded (table 5).

The interasset dispersion shows its highest values in the four Atlantic provinces. Tables 6a and 6b show that the above interasset comparisons for other provinces are similar to Ontario's. The obvious exception is the four Atlantic provinces. In these provinces, the federal investment tax credit is available for qualifying investment expenditures on structures and machinery.[9] As a result of the investment tax

TABLE 5
Structure of Canadian Effective Corporate Tax Rates Across Provinces, 1991 (excluding mining industry)

		BC	Alta	Sask	Man	Ont	Que	NB	NS	PEI	Nfld
A, F, & F	C	12.1	10.6	13.0	13.2	11.1	9.4	3.4	4.0	3.9	4.1
	L	27.6	28.1	30.0	31.7	25.8	24.3	21.1	20.1	19.1	21.1
	S	10.6	8.9	11.2	11.2	9.6	7.7	2.0	2.6	2.6	2.6
Mfg	C	32.1	32.1	34.9	36.5	30.1	28.5	21.9	20.9	19.8	22.0
	L	34.0	34.4	36.9	38.7	31.8	30.3	24.4	23.1	21.8	24.4
	S	17.9	15.3	18.8	18.8	16.3	13.4	3.5	4.7	4.7	4.7
Const	C	32.8	31.0	34.9	35.6	34.5	28.0	32.0	32.2	31.8	32.7
	L	47.3	47.8	49.5	51.4	49.1	42.3	47.5	46.4	45.3	47.5
	S	24.0	20.8	25.1	25.1	25.1	18.3	22.4	23.6	23.6	23.6
Tr & St	C	16.3	16.3	19.7	20.7	18.7	15.8	10.9	10.3	9.6	11.0
	L	20.2	20.6	23.7	25.1	22.7	19.2	15.5	14.6	13.7	15.5
	S	1.9	1.4	2.1	2.1	2.1	1.1	−2.0	−1.8	−1.8	−1.8
Comm	C	14.0	14.2	17.4	18.5	16.3	13.8	15.1	14.5	13.9	15.1
	L	14.4	14.7	17.8	19.0	16.7	14.1	15.6	14.9	14.3	15.6
	S	1.1	0.7	1.2	1.2	1.2	0.5	0.1	0.2	0.2	0.2
Pub Utl	C	15.1	15.4	18.2	19.4	17.3	14.4	15.5	14.8	14.1	15.5
	L	15.7	16.0	18.8	20.1	17.9	14.9	16.2	15.4	14.8	16.2
	S	10.4	8.7	11.0	11.0	11.0	7.5	9.4	10.0	10.0	10.0
Ws Trade	C	28.2	27.4	30.8	31.8	30.2	25.0	27.5	27.3	26.7	27.9
	L	36.6	37.0	39.4	41.2	38.8	32.9	36.9	35.8	34.8	36.9
	S	16.4	14.0	17.2	17.2	17.2	12.2	14.3	15.2	15.2	15.2

Rt Trade	C	21.0	19.9	23.3	24.0	22.7	18.4	21.2	21.2	20.9	21.6
	L	30.8	31.3	34.0	35.7	33.2	28.1	32.4	31.5	30.5	32.4
	S	13.7	11.6	14.5	14.5	14.5	10.1	12.9	13.7	13.7	13.7
Service	C	13.3	12.3	15.3	15.7	14.7	11.8	9.7	9.8	9.6	10.1
	L	22.0	22.4	25.0	26.4	24.2	20.1	20.3	19.5	18.6	20.3
	S	8.7	7.3	9.3	9.2	9.2	6.2	3.9	4.4	4.4	4.4
Aggre	C	23.9	22.4	22.1	26.8	26.0	22.4	19.0	18.8	16.5	17.6
	L	28.6	29.1	29.6	32.8	30.2	26.5	24.1	23.5	23.9	21.3
	S	13.7	12.0	12.9	13.5	13.8	10.0	9.2	10.1	8.1	9.8
Dispersion											
Overall		13.0	12.9	13.0	13.7	12.9	11.0	16.5	16.6	17.2	14.6
Asset		10.0	9.8	10.2	10.4	11.2	8.6	14.3	14.4	14.3	12.4
Industry		7.6	7.9	8.7	8.6	6.1	6.1	8.5	8.3	7.9	8.0

TABLE 6a
Effective Provincial Corporate Tax Rates by Asset Type, 1991 (excluding the mining industry)

	Land	Bldg	Machin	Invent
Alberta	7.95	13.88	21.18	37.82
British Columbia	8.15	14.92	21.92	39.91
Manitoba	10.75	18.62	25.41	43.26
New Brunswick	8.46	9.85	8.22	41.20
Newfoundland	6.47	10.35	10.85	41.29
Nova Scotia	8.38	9.35	7.52	40.84
Ontario	10.39	17.31	20.71	43.03
PEI	10.16	7.92	4.97	37.05
Quebec	8.45	15.03	20.56	39.37
Saskatchewan	11.10	16.33	22.56	37.71

credit, the ETRs on depreciable assets are close to, or even lower than those on land.

By including the mining industry, we obtain results on effective tax rates by asset type presented in table 6b. Comparing this with table 6a, we find that the mining industry that faces a negative ETR on marginal investments causes the aggregate ETR on each asset to fall.[10] Combined with a dominant weight for machinery in the mining industry (refer to table A.3a), this diminishing of aggregate ETR on assets significantly decreased ETRs on machinery across provinces. In New Brunswick and Newfoundland, the significant share of capital invested in mining, relative to capital investment in other industries, further reduced the ETRs on machinery, aggregated across all industries in these two provinces.

The interindustry dispersion shows its highest value in Prince Edward Island. This is an outcome of its industrial structure and the general characteristics of the tax system. From table A.3b, we can see that, in Prince Edward Island, agriculture, fishing, and forestry are the lowest-taxed industries and account for 24 per cent of PEI's capital – the highest share of capital compared with that of any other province. Wholesale trade and construction, the two highest-taxed industries, account for another 19 per cent of capital.

A similar but less variable distribution of capital stock among industries appears in Saskatchewan and Manitoba. In these two provinces, agriculture, fishing, and forestry account for 20 per cent and 10 per cent of capital, respectively. Also, the three of their highest-

TABLE 6b
Effective Provincial Corporate Tax Rate by Asset Type, 1991 (including the mining industry)

	Land	Bldg	Machin	Invent	E & D
Alberta	7.36	14.04	14.56	38.52	–125.76
British Columbia	7.95	15.05	17.77	40.87	–132.60
Manitoba	10.43	18.47	18.53	43.49	–265.25
New Brunswick	7.61	9.39	–9.76	41.46	–184.37
Newfoundland	4.76	9.83	–12.01	41.53	–173.66
Nova Scotia[a]	8.38	9.35	7.52	40.84	
Ontario	10.38	17.27	17.96	43.30	–110.48
PEI[a]	10.16	7.92	4.97	37.05	
Quebec	8.25	15.01	18.62	36.47	–126.07
Saskatchewan[a]	11.10	16.33	22.56	37.71	

a. The aggregate number does not incorporate the mining industry.

taxed industries (i.e., manufacturing, construction, and wholesale trade) account for 30 per cent of capital in Manitoba and 18 per cent of capital in Saskatchewan.

In contrast, the three Atlantic provinces (besides PEI) have dispersion indices similar to Saskatchewan's and Manitoba's even though investments in the former provinces are able to take advantage of the federal ITC, while those in the latter provinces cannot. The Atlantic provinces have a less variable distribution of capital across industries compared with Manitoba and Saskatchewan. However, owing to the investment tax credit, the ETR in agriculture, fishing, and forestry in the Atlantic provinces is about six points lower than it is in other provinces, while the ITC is not available to high-taxed construction and wholesale trade in the Atlantic provinces. Therefore, the gap between the highest and the lowest ETR in the Atlantic provinces (28 percentage points versus 22 percentage points, respectively) is much wider than it is in other provinces. Hence, despite a much smoother distribution of capital stock among industries, the industry dispersions in the three Atlantic provinces (besides PEI) are only slightly lower than those in Manitoba and Saskatchewan.

Ontario and Quebec possess the lowest interindustry dispersion in effective tax rates. Apart from manufacturing, most of the other industries with ETRs significantly different from the average ETR account for a relatively small share of capital. For example, the agriculture, fishing, and forestry, and construction sectors (e.g., the lowest-taxed

and the second-highest-taxed sectors, respectively) account for only two to three percentage points of total capital.

The overall dispersion index is obviously the combined result of interindustry and interasset dispersion indices. Not surprisingly, the four Atlantic provinces possess higher overall dispersions, with PEI having the highest one. Quebec, followed by Ontario, shows the lowest overall dispersion. The other four provinces are between these two extremes.

Conceptually, introducing a heavily subsidized industry like mining must increase all the dispersions. The results of table 2 confirm this expectation. Furthermore, the degree of this effect depends on the share of capital held by the mining industry combined with the generosity of the subsidy.

Therefore, the ETR and the dispersions in Saskatchewan, Nova Scotia, and PEI,[11] for which we do not include the mining industry, remain the same as those in table 5.

In Quebec and Ontario, owing to a very low capital-stock weight for mining (around 4 per cent), all the dispersions increased, but only slightly, in relation to changes in other provinces. Hence, Quebec and Ontario are still the two provinces with the lowest dispersion in effective tax rates. More specifically, the mining capital-stock weight in Ontario is the lowest among all provinces possessing a mining industry, such that the decrease in the aggregate ETR in Ontario is the smallest (about one percentage point). Given the greater importance of mining in Manitoba, the inclusion of the mining industry makes Ontario the highest-taxed province.

In contrast, as a result of the importance of mining and its low effective tax rate, the dispersion in the effective tax rates in Newfoundland and New Brunswick is significantly increased and greatest among those of all the provinces. Moreover, their aggregate ETRs dropped significantly and became the lowest among those of all provinces.

1992 ETR Calculations

In 1992, the Ontario government ceased to provide a 30 per cent allowance for investments in machinery and equipment used by the agriculture, fishing and forestry, and manufacturing industries. Automatic depletion for Ontario corporate tax purposes is also being phased out and replaced by a resource allowance. The 1992 federal budget also increased capital-consumption allowances for manufac-

turing investments (Class 39) from 25 per cent to 30 per cent, and will have lowered the manufacturing tax rate an additional two percentage points by 1994. Provinces followed federal base changes and brought in new corporate income and capital tax rates as shown in table A.7. These changes are incorporated in table 7.

We note that the 1992 ETR for Ontario is relatively higher than those for other provinces even though the manufacturing sector – a significant portion of industrial stock in Ontario – benefited from several federal budget changes. Some of the factors that contributed to a higher effective tax rate in Ontario compared with other provinces included the following:

1. Owing to the decrease in Ontario's automatic depletion rate relative to the increase in Ontario's mining tax resource allowance rate,[12] the ETR on mining, which is the lowest-taxed industry, increases.
2. The elimination of Ontario's 30 per cent deduction for qualifying investment expenditures in agriculture, fishing, and forestry, and manufacturing investment largely offset the reduction of the statutory tax rates and increased capital consumption allowances provided for manufacturing in federal and provincial budgets. The lower inflation rate in Canada (3 per cent) benefited manufacturing so that the overall effective tax rate on manufacturing investments did decline, but not as much as it did in some other provinces.

In table 8, we examine the impact of different assumptions on the aggregate effective tax rates by provinces. We ignore mining in these calculations. We conclude from this table the following:

1. Assuming the same distribution of industry capital across all provinces, we find the 1992 Ontario effective tax rate is the third highest (below Manitoba's and Saskatchewan's) rather than *the* highest. Manufacturing, which tends to be more highly taxed, raises somewhat the effective tax rate in Ontario compared with those in other provinces.
2. Assuming that all industries have the same debt/asset ratios used to finance capital, we find that Ontario has the third-highest effective tax rate in 1992 – below that of Manitoba and Quebec. The assumption of a constant debt/asset ratio across industries lowers the effective tax rate in agriculture, fishing, and forestry, manufacturing, and construction, and raises the effective tax rate for

TABLE 7
Structure of Canadian Effective Corporate Tax Rates across Provinces, Post-1992 Budget

		BC	Alta	Sask	Man	Ont	Que	NB	NS	PEI	Nfld
A, F, & F	C	14.3	12.0	14.7	14.9	14.5	11.8	5.7	6.3	6.3	6.4
	L	30.0	29.6	31.8	33.4	30.4	26.7	23.5	22.4	21.4	23.5
	S	12.8	10.3	12.8	12.8	12.8	10.0	4.1	4.9	4.9	4.9
Mfg	C	27.6	26.8	30.0	31.4	28.4	21.8	15.0	14.1	13.1	15.2
	L	29.2	28.7	31.7	33.3	29.9	23.1	17.0	15.8	14.6	17.0
	S	16.4	13.3	16.4	16.4	16.4	11.1	1.0	2.0	2.0	2.0
Const	C	29.7	27.1	30.9	31.6	30.4	25.9	27.7	28.0	27.6	28.3
	L	43.4	42.9	45.0	46.9	44.5	38.5	42.3	41.3	40.2	42.3
	S	21.7	17.8	21.7	21.7	21.7	17.5	19.1	20.1	20.1	20.1
Tr & St	C	19.4	18.7	22.2	23.3	21.1	19.0	13.7	13.1	12.4	13.8
	L	23.1	22.7	26.0	27.4	24.9	22.4	18.0	17.1	16.2	18.0
	S	4.5	3.4	4.5	4.5	4.5	3.3	0.6	0.9	0.9	0.9
Comm	C	18.7	18.3	21.6	22.8	20.5	18.4	19.3	18.6	17.9	19.3
	L	19.2	18.8	22.0	23.3	21.0	18.8	19.8	19.1	18.4	19.8
	S	3.5	2.6	3.5	3.5	3.5	2.5	2.3	2.6	2.6	2.6
Pub Utl	C	18.2	17.8	20.8	22.0	19.8	14.5	18.0	17.3	16.6	18.0
	L	18.8	18.4	21.4	22.7	20.4	14.9	18.6	17.9	17.2	18.6
	S	13.0	10.4	13.0	13.0	13.0	10.3	11.4	12.0	12.0	12.0
Ws Trade	C	26.5	24.8	28.4	29.4	27.7	24.2	24.7	24.5	24.0	25.1
	L	34.5	34.0	36.7	38.4	35.9	31.7	33.6	32.7	31.7	33.6
	S	15.4	12.4	15.4	15.4	15.4	12.1	12.5	13.3	13.3	13.3

Rt Trade	C	20.1	18.3	21.7	22.4	21.1	18.4	19.4	19.5	19.2	19.9
	L	29.4	28.9	32.1	33.7	31.1	27.8	30.0	29.1	28.2	30.0
	S	13.3	10.7	13.3	13.3	13.3	10.5	11.8	12.5	12.5	12.5
Service	C	14.8	13.3	16.4	16.8	15.8	13.3	10.9	11.0	10.8	11.3
	L	23.8	23.4	26.2	27.7	25.3	21.8	21.6	20.7	19.9	21.6
	S	10.0	8.0	10.0	10.0	10.0	7.5	4.9	5.5	5.4	5.4
Mining	C	−6.3	−13.5	N/A	−90.2	−35.6	−18.2	−85.9	N/A	N/A	−79.1
	L	−6.3	−13.5	N/A	−90.2	−35.6	−18.2	−85.9	N/A	N/A	−79.1
	S	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Aggre	C	20.1	15.9	21.9	21.7	23.7	18.9	8.7	16.8	15.2	5.8
	L	23.1	19.1	29.0	25.8	27.2	21.8	10.4	21.0	21.7	6.7
	S	13.7	11.4	13.2	13.2	13.7	10.1	8.5	9.4	8.3	9.2

Note: Inflation is 3 per cent, nominal interest rate is 9 per cent, CCA rate for class 29 is 30 per cent, manufacturing corporate tax rate is reduced by two percentage points.

TABLE 8
Sensitivity Analysis: Canadian Effective Corporate Tax Rates across Provinces, 1992

	Base	Case 1	Case 2	Case 3	Case 4
British Columbia	22.83	23.43	20.80	22.63	21.13
Alberta	20.86	22.13	19.63	21.36	19.86
Saskatchewan	22.91	27.07	21.71	22.42	20.93
Manitoba	25.39	26.74	24.20	25.51	24.04
Ontario	25.19	24.47	22.84	26.11	23.26
Quebec	20.07	19.93	24.00	16.48	21.62
New Brunswick	17.19	16.54	16.07	17.96	16.60
Nova Scotia	15.54	14.87	14.31	16.39	14.89
Prince Edward Island	15.24	15.36	13.01	15.88	13.15
Newfoundland	17.43	16.78	18.76	17.05	18.68

Note:
1. Base with inflation rate = 0.03 and debt/asset ratio different across industry
2. Case 1 with the capital structure by industry same as national structure
3. Case 2 with the inflation rate = 0.03 and debt/asset ratio constant across industry
4. Case 3 with inflation rate = 0.05 and debt/asset ratio different across industry
5. Case 4 with inflation rate = 0.05 and debt/asset ratio constant across industry

most of the other industries. As a result, Ontario (with a large manufacturing base), Saskatchewan (largely agriculture), British Columbia, and the Atlantic provinces (with significant fishing and forestry industries) face lower effective tax rates on capital.

3. Assuming a higher inflation rate and industry-specific debt/asset ratios (case 3) and constant debt/asset ratios (case 4), we find that Ontario becomes more highly taxed and remains the highest-taxed province (case 3) or second-highest-taxed province. Thus, Ontario's position as relatively highly taxed remains the same regardless of inflation. We note that inflation tends to lower effective tax rates in Quebec. This finding is largely attributable to Quebec's having industries that leveraged (case 3), and a greater reliance on capital taxes rather than corporate income taxes. With respect to the latter point, the effective capital tax rate falls in the presence of inflation since assets are not indexed for inflation in calculating taxable capital.

Conclusions

The above analysis suggests three major conclusions:

1. Among all the industries in Ontario, mining, followed by agri-

culture, fishing, and forestry, and services, are the most favoured, while construction and wholesale trade are the least favoured.
2. Ontario industry faces one of the highest effective tax rates on capital compared with ETRs for all other provinces in Canada. However, Ontario's effective tax rate is not that much higher than those of other provinces, except for the Atlantic provinces (which benefit from the federal investment tax credit) and Alberta (which has a relatively low corporate tax rate, especially for small businesses, and no general capital tax).
3. Despite recent tax reform measures, considerable variation exists in effective tax rates on capital in Ontario (and other provinces). In part, such variation is attributable to fast write-offs (e.g., for exploration and development in mining), the deductibility of interest that benefits some industries more than others, and differential corporate tax rates (e.g., for small business and manufacturing).

Appendix A: The Methodology

The results presented in this report are related only to the case of investments[13] made by firms that pay full taxes. Two sizes of organization were taken account of: large companies and small companies (the latter claiming the small-business income deduction). The aggregate, or combined, results are, therefore, the weighted average of the results of large-sized and small-sized firms. Therefore, we did three sets of calculations, i.e., for large and small firms, and for the combination of the two.

For each of the three cases, we calculated effective tax rates for 10 industry sectors, 4 general asset types, and 33 specific asset types (5 general asset types in the case of the mining industry). We also calculated aggregate effective tax rates and three dispersion measures (overall dispersion, interindustry dispersion, and interasset dispersion). The last named were calculated only for the "combined" case.

Besides the technical assumptions provided in the introduction, our estimates of the effective tax rates on investment decisions involve a theoretical assumption, that the firm maximizes its value of cash flows by investing in capital until the marginal rate of return on capital is equal to the cost of capital. If we think of the marginal revenue product (MRP) net of economic depreciation as the gross rate of return on capital (Rg), then, in equilibrium, the gross rate of return must be

equal to the financial cost of capital, adjusted for taxes (the marginal return on capital is thus equal to the rental cost of capital, or user cost, net of depreciation). We may employ the user cost of capital net of depreciation, which consists of variables that we can observe or estimate, as a proxy for the required gross rate of return on a marginal investment.

1. The User Cost of Capital

In the absence of taxes, the user cost of capital for *depreciable assets* consists of the real cost of financing the marginal investment in real terms (r, the real cost of finance, is equal to the nominal cost, R, less the rate of inflation, π), plus the economic rate of depreciation (δ). The former is the weighted average of cost of debt (i) and cost of equity (ρ) and the latter is calculated by subtracting real capital gains from physical depreciation rate. That is

$$r = \beta i\,(1-u) + (1-\beta)\rho - \pi$$

and

$$\delta = d - \Delta q/q$$

with β = debt asset ratio, u = statutory tax rate, π = inflation rate, d = physical depreciation rate, and q = replacement cost of capital.

Based on our assumption of profit maximization, the marginal revenue product (MRP) must be equal to the user cost of capital. The marginal revenue product is reduced by corporate taxes to MRP$(1-u)$ and the cost of purchasing an asset is reduced by the present value of tax depreciation allowances, investment tax, and, as discussed below, increased by the capital tax. That is, the user cost of capital is equal to the following expression:

$$\text{MRP} = (R - \pi + \delta)(1-A)/(1-u) \qquad (1)$$

In the case of *inventories*, if we ignore unit storage costs and any real changes in the value of the inventory, the opportunity cost for holding a dollar of inventory over a period of time is equal to the real cost of funds (r) plus any taxation of inflationary gains of product. Ignoring the capital tax, the optimal marginal condition for holding inventory is

$$\text{MRP} = (r + u\pi)/(1 - u) \tag{2}$$

In the case of *land*, while the rental costs are considered as current costs, the firm is not able to write off the cost of owning land, which is also equal to the real cost of financing the land (r). Therefore, the optimal marginal condition for owning land is

$$\text{MRP} = (R - \pi)/(1 - u) = r/(1 - u) \tag{3}$$

2. The Capital Tax

Capital taxes are imposed on all corporations, besides the financial sector, in Ontario, Quebec, Saskatchewan, Manitoba, and, after 1992, in British Columbia (except new investments).

The capital tax applies to the assets held by firms and is deductible from corporate taxable income. In Ontario, assets are measured according to the tax definition of assets (e.g., assets are depreciated according to tax rules). Since the capital tax is imposed directly on capital carried at historical cost rather than the replacement cost of assets, the firm pays capital tax equal to the product of capital tax rate (τ) and undepreciated original cost of asset in each period. In essence, the capital tax increases the purchasing cost of assets (thereby offsetting the value of depreciation allowances granted for tax purposes as well as the investment tax credit). The amount of capital tax paid in each period is discounted by the nominal cost of financing (R, or $r + \pi$), and the present value of capital tax payments is equal to $\tau/(a + R)$ (the formula is slightly more complicated as it takes into account the half-year convention used for depreciation).

In the case of the *depreciable* assets, the user cost, corrected for both corporate income and capital taxes, is the following:

$$\text{MRP} = (r + \delta)[1 - uZ + \tau(1 - u)/(a + R)]/(1 - u) \tag{1'}$$

(where Z denotes the present value of capital cost allowances, and uZ is the tax value of the capital cost allowances).

As for *inventories*, the capital tax applies to the value of inventory assets measured according to FIFO principles. Since the capital cost defined above is the real financial cost r, while the capital tax is imposed on the inflationary profits of inventories, we have

$$\text{MRP} = (r + u\pi)/(1 - u) + \tau \tag{2'}$$

In the case of *land*, capital tax is imposed on the original cost of land, which is the real cost of finance; therefore, we have

$$\text{MRP} = r[1 + \tau(1-u)/(r+\pi)]/(1-u) \qquad (3')$$

3. Additional Complications

In the Atlantic provinces, the investment tax credit is still available for depreciable assets. The credit reduces the cost of purchasing assets by φ. In addition, under Canadian law, the investment tax credit reduces the capital cost of assets used to calculate capital cost allowances. Thus, the effective purchase cost of capital, net of tax depreciation and the investment tax credit, reduces each dollar of cost to $1 - \varphi - uZ(1-\varphi) = (1-uZ)(1-\varphi)$. The investment tax credit also reduces capital tax payments that apply only to the tax value of assets, that is, net of the investment tax credit. Given the elimination of the investment tax credit at the federal level, except in the Atlantic provinces and certain slow-growth regions, there is little interaction between the investment tax credit and capital taxes since only Quebec, Ontario, Manitoba, and Saskatchewan have general capital taxes.

The special Ontario allowance (denoted as the rate m) for qualifying investments in machinery reduces the cost of purchasing an asset by um. This allowance does not affect the capital cost allowances.

Mining ETR calculations incorporate mining tax provisions. For a detailed discussion of these formulas, see Boadway, McKenzie, and Mintz (1989). These formulas are adjusted to include the capital tax as described above.

4. Effective Tax Rates

We define the effective tax rate on a given type of capital as the proportional difference between the before-tax rate return required by an investor, Rg, and the after-tax rate of return required by a saver, Rn. Rg is calculated by taking the difference between the marginal revenue product (or user cost, in equilibrium) and depreciation as defined above. The after-tax rate of return is the weighted average of the return to debt and equity securities held by the investor. Thus, the effective tax rate (t) is determined by equation 4:

$$t = (Rg - Rn)/Rg \qquad (4)$$

and

$$Rn = \beta i + (1 - \beta)\rho - \pi \tag{5}$$

It should be noted that Rn is different from r (or R). The former is the after-tax rate of return required by a saver, whereas the latter is the after-tax cost of financing paid by a firm.

5. Aggregation

In addition to showing effective tax rates for individual asset types by industry sectors, the tables in the body of this paper show aggregate effective tax rates for each sector (i) and for each asset type (j). We undertook the aggregation by weighting the before-tax (Rg) and after-tax (Rn) rates of return by the corresponding capital-stock weights (cw_{ij}) and then calculating the effective tax rate using equation 4. For example, the effective aggregate tax rate for industry i is calculated as follows:

$$t_i = (\Sigma_j Rg_{ij} cw_{ij} - \Sigma_j Rn_{ij} cw_{ij})/(\Sigma_j Rg_{ij} cw_{ij}) \tag{6}$$

where j equals 1, 2, 3, and 4 for land, buildings, machinery, and inventory (j also equals 5 for exploration and development assets in mining industry), and i equals 1 to 10 for 10 major industries in Canada. We follow a similar procedure in calculating aggregate tax rates for asset types and the overall aggregate tax rate.

6. Dispersion

We use three measures of dispersion (or weighted standard deviation): overall dispersion, interindustry dispersion, and interasset dispersion. The methodology for calculating their values is as follows:

Let C_i, C_j, and C_{ij} denote the normalized capital stock weights for the $_i{}^{th}$ industry sector and the $_j{}^{th}$ asset type, respectively. Overall dispersions are calculated as the standard deviation

$$\sigma = \{\Sigma_i \Sigma_j C_{ij}(t_{ij} - t)^2\}^{1/2} \tag{7}$$

The interindustry dispersion is calculated as the weighted standard deviation

$$\sigma_I = \Sigma_j C_j \{\Sigma_i C_{ij}(t_{ij} - t_j)^2\}^{1/2} \quad (8)$$

The interasset dispersion is calculated as the weighted standard deviation

$$\sigma_J = \Sigma_i C_i \{\Sigma_j C_{ij}(t_{ij} - t_i)^2\}^{1/2} \quad (9)$$

The expressions t, t_i, and t_j are the average effective tax rates for the overall aggregate, industry i, and asset j, respectively.

Appendix B: Description of the Data

1. Statutory Corporate Income Tax Rates

The actual statutory federal and provincial income rates are used. The federal income tax rates are 28.84 per cent, 23.84 per cent, and 12.84 per cent for general, manufacturing, and small businesses, respectively. The provincial corporate income tax rates are shown in the tables below.

2. Combined Statutory Tax Rate (u)

For a given industry other than the mining industry, the combined statutory tax rate is the weighted sum of the statutory corporate tax rates of general business and small business, both of which are simple sums of related federal and provincial statutory corporate tax rates. For example, for the manufacturing industry in Ontario, the federal corporate tax rates on general and small firms are 23.84 per cent and 12.84 per cent, respectively, and the provincial counterparts are 14.5 per cent and 10 per cent, respectively. Therefore, the aggregate statutory rates for general and small firms are 38.34 and 22.84 per cent, respectively. As a result, the combined statutory tax rate for the manufacturing industry in Ontario is the weighted sum of them, which is 36.46 per cent.

3. The Rate of Inflation (π)

An expected rate of inflation of 5 per cent is assumed for 1991 and of 3 per cent for 1992. These rates represent an average of the rates determined by various forecasting agencies.

4. Nominal Interest Rate on Debt (i)

The nominal (risk-free) interest rate on debt is assumed to be 11 per cent in 1991 and is reduced to about 9.4 per cent in 1992 (using an open-economy interest rate arbitrage equation, as discussed below).

5. Debt/Asset Ratio (β)

The debt/asset ratio differs from industry to industry. It was determined by dividing the yearly total investment in a given industry by the related new debt. The source is aggregate data obtained from the Department of Finance.

6. Nominal Cost of Equity Finance (ρ)

Given the open-economy assumption, capital market equilibrium requires that the after-tax rate of return to a "marginal investor" on equity must be equal to the after-tax rate of return on debt, i.e., $(1 - c)\rho = (1 - m)i$, where c and m are the international averages of personal tax on bond interest and capital gains tax on personal income, respectively. From this, we obtained $\rho = i(1 - m)/(1 - c)$.

"Reasonable" values for c and m are assumed to be 0.25 and 0.10, respectively. Given a nominal rate of interest on debt of 11 per cent, this implies a nominal risk-free required rate of return on equity of 9.17 per cent in 1991.

7. Capital Cost Allowance (CCA) Rate (α)

A weighted average is used for α in the formulas presented in appendix A. A weighted average is computed by using the Department of Finance data on CCA rate for each class.

8. Physical Rate of Depreciation in the Mining Industry (d)

Exponential rates of physical depreciation of 8 and 10 per cent are used for buildings and equipment, respectively. The source is the result obtained by Boadway, McKenzie, and Mintz (1989).

9. Economic Depreciation Rates (δ)

Economic depreciation rate is calculated by subtracting real capital gain from physical depreciation rate. The source is aggregate data obtained from the Department of Finance.

10. Federal Investment Tax Credit (ITC) Rate (φ)

The original average ITC rates for CCA class are determined using Department of Finance data. Then, an overall weighted-average ITC rate is determined, using the same weights used to compute the average CCA rate.

Except for the Maritime provinces, the 1987 tax reform largely eliminates the ITC. Our figures are adjusted to reflect this change.

11. Capital Weight by Industry/Asset Type (cw_{ij})

Capital stock weights were calculated by multiplying the capital weight of a given asset type (cw_j) in a given industry by the capital weight of a given industry (cw_i) in a given province. While the capital structures in a given industry are the same across provinces, the industrial structures measured by capital weights are different between provinces. The aggregate data was obtained from the Department of Finance.

12. Other Parameters

a. Federal and Provincial Income Tax Parameters:

Federal resource allowance rate (σ) = 0.25
Federal CDE (Canadian development expenses) rate = 0.30
Ontario Automatic Depletion Allowance rate = 0.1333 in 1991. (It started to be phased out in 1989 and was zero by 1 January 1993.)

b. Provincial Mining Tax Parameters

Province	Basic mining tax rate(u_m)	Maximum process allowance(Ψ)	Depreciation rate mining (α_m)	Depletion rate (d_m)
Ont	20	65	30 sl	N/A
Que	18	65	30 sl	33
BC	13	N/A	N/A	N/A
Nfld	16	65	10 db	N/A
NB	16	65	33 db	50
Man	20	65	20 db	N/A
NS	15	65	100 db	N/A
Alta	12	65	15 db	N/A

Note:
sl = straight line method
db = declining balance method
Source: Boadway, McKenzie, and Mintz 1989

TABLE A.1
Ontario Statutory Corporate Tax Rate (1991)

	Aggregate			Provincial		
	Comb.	Large	Small	Comb.	Large	Small
A, F, & F	0.2502	0.4334	0.2284	0.1048	0.1450	0.1000
Mfg	0.3646	0.3834	0.2284	0.1395	0.1450	0.1000
Const	0.3091	0.4434	0.2284	0.1206	0.1550	0.1000
Tr & Stor	0.4146	0.4434	0.2284	0.1476	0.1550	0.1000
Comm	0.4396	0.4434	0.2284	0.1540	0.1550	0.1000
Pub Utl	0.4403	0.4434	0.2284	0.1542	0.1550	0.1000
Ws Trade	0.3588	0.4434	0.2284	0.1334	0.1550	0.1000
Rt Trade	0.3259	0.4434	0.2284	0.1249	0.1550	0.1000
Service	0.3134	0.4434	0.2284	0.1218	0.1550	0.1000

Note: A further 30 per cent allowance is granted for investments in machinery and equipment in the A, F, & F and manufacturing industries for provincial taxation purposes for the year 1991.

TABLE A.2
Debt/Asset Ratio After Tax-Rate Return, and Before-Tax Rate Return

			Rg		
	β	Rg	Comb.	Large	Small
A, F, & F	0.2500	0.0463	0.0520	0.0624	0.0512
Mfg	0.2900	0.0470	0.0672	0.0689	0.0561
Const	0.2400	0.0461	0.0703	0.0906	0.0615
Tr & Stor	0.4900	0.0507	0.0623	0.0655	0.0517
Comm	0.4600	0.0501	0.0599	0.0602	0.0507
Pub Utl	0.4100	0.0492	0.0595	0.0599	0.0552
Ws Trade	0.3700	0.0485	0.0694	0.0791	0.0585
Rt Trade	0.4000	0.0490	0.0634	0.0734	0.0573
Service	0.4400	0.0497	0.0583	0.0656	0.0548
Mining	0.4000	0.0490	0.0365	0.0365	N/A

TABLE A.3a
Distribution of Capital Stock within Industry by Asset Type and Firm Size

		Land	Bldg	Machin	Invent	E&D	Aggreg
A, F, & F	C	58.3	16.0	16.9	8.8		100.0
	L	5.3	1.6	2.8	0.9		10.6
	S	53.0	14.4	14.1	7.9		89.4
Mfg	C	5.4	27.0	39.9	27.7		100.0
	L	4.3	23.7	35.9	23.9		87.8
	S	1.1	3.3	3.9	3.8		12.2
Const	C	7.9	11.9	36.1	44.0		100.0
	L	2.9	4.7	13.4	16.6		37.5
	S	5.1	7.2	22.7	27.4		62.5
Tr & Stor	C	4.7	51.1	39.6	4.6		100.0
	L	4.1	41.9	36.3	4.2		86.6
	S	0.6	9.2	3.2	0.4		13.4
Comm	C	2.1	58.7	39.1	0.0		100.0
	L	2.1	57.7	38.4	0.0		98.2
	S	0.0	1.1	0.7	0.0		1.8
Pub Utl	C	0.7	2.4	93.1	3.8		100.0
	L	0.7	2.0	92.1	3.8		98.6
	S	0.0	0.4	1.0	0.0		1.4
Ws Trade	C	13.6	28.1	10.1	48.2		00.0
	L	8.2	17.0	6.3	29.1		60.7
	S	5.4	11.1	3.8	19.1		39.3
Rt Trade	C	16.3	30.3	10.7	42.7		100.0
	L	7.3	13.6	5.0	19.4		45.3
	S	8.9	16.6	5.8	23.3		54.7
Service	C	17.3	38.8	38.5	5.4		100.0
	L	6.7	15.4	15.2	2.2		39.6
	S	10.5	23.4	23.4	3.1		60.4
Mining	C	1.5	2.2	54.4	9.8	3.2	100.0
	L	1.5	2.2	54.4	9.8	3.2	100.0
	S	0.0	0.0	0.0	0.0	0.0	0.0
Total	C	12.79	26.65	37.85	19.50	3.20	100.00
	L	4.33	17.99	29.98	10.99	3.20	66.50
	S	8.45	8.66	7.87	8.51	0.00	33.50

Note: Weights within industry are set to add up to 100. This industrial capital structure by firm size is applied for all provinces. A weight of 0.0 implies a negligible amount.

TABLE A.3b
Distribution of Capital Stock among Industrial Divisions by Province (all corporations)

	BC	Alta	Sask	Man	Ont	Que	NB	NS	PEI	Nfld
A, F, & F	4.2	4.0	19.6	9.6	3.3	2.8	4.2	4.6	23.9	1.7
Mfg	26.6	8.6	8.2	27.0	49.5	41.6	24.8	30.6	18.6	13.6
Const	3.8	3.7	3.1	2.0	2.1	2.4	3.6	4.8	4.7	3.2
Tr & St	11.8	5.1	10.1	13.3	9.2	13.3	13.1	14.0	9.1	25.1
Comm	6.5	2.9	5.6	7.4	5.1	7.4	7.2	7.8	5.0	13.9
Pub Utl	5.0	2.4	4.4	5.5	2.1	2.7	4.6	4.8	3.8	2.6
Ws Trade	10.1	5.0	7.5	10.7	8.8	9.2	10.6	12.9	14.6	7.6
Rt Trade	9.2	4.5	6.8	9.8	8.0	8.4	9.6	11.8	13.3	6.9
Service	7.4	3.9	4.6	6.7	7.7	7.8	5.7	8.8	7.1	2.5
Mining	12.1	9.7	16.5	8.1	4.2	4.5	16.7	0.0	0.0	23.0
Oil & Gas	3.4	50.2	13.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aggregate	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Note: Columns may not add up because of rounding.

Source: Jack Jung, "The Calculation of Marginal Effective Corporate Tax Rate in the 1987 White Paper on Tax Return," Working Paper No. 89-6 (Ottawa: Department of Finance 1989), Table A-2d

TABLE A.4
Present Value of Capital Cost Allowance Deductions (Z)

	Building			Machinery		
	Comb	Large	Small	Comb	Large	Small
A, F, & F	0.4707	0.4531	0.4704	0.7251	0.7406	0.7228
Mfg	0.3828	0.3757	0.4259	0.7526	0.7573	0.7476
Const	0.3986	0.4137	0.4222	0.7508	0.7544	0.7427
Tr & Stor	0.4435	0.4430	0.4300	0.6333	0.6193	0.7289
Comm	0.3547	0.3517	0.4430	0.6993	0.7000	0.6858
Pub Utl	0.5014	0.4175	0.2993	0.4950	0.4922	0.2993
Ws Trade	0.4574	0.4479	0.4696	0.7483	0.7557	0.7387
Rt Trade	0.5482	0.5994	0.5043	0.7343	0.7440	0.7290
Service	0.4657	0.4863	0.4536	0.7491	0.7692	0.7357
Mining	0.6400	0.6400	N/A	0.8800	0.8800	N/A

Note: $Z = 0.5\ \alpha + (1 - 0.5\ \alpha)\alpha/((\alpha + r + \pi)*(1 + r + \pi))$ based on declining-balance method with half-year rule. Z in mining industry was calculated taking into account mining tax provisions.

TABLE A.5
Investment Tax Credit in Atlantic Provinces

	Building			Machinery		
	Comb	Large	Small	Comb	Large	Small
A, F, & F	0.0713	0.0695	0.0716	0.0946	0.0875	0.0953
Mfg	0.0900	0.0901	0.0899	0.0880	0.0882	0.0866
Const	0.0015	0.0032	0.0009	0.0160	0.0287	0.0120
Tr & Stor	0.0343	0.0398	0.0008	0.0389	0.0360	0.0460
Comm	0.0001	0.0001	0.0014	0.0013	0.0010	0.0084
Pub Utl	0.0008	0.0000	0.0032	0.0071	0.0071	0.0078
Ws Trade	0.0333	0.0314	0.0358	0.0366	0.0474	0.0226
Rt Trade	0.0103	0.0021	0.0150	0.0064	0.0091	0.0051
Service	0.0066	0.0188	0.0028	0.0215	0.0171	0.0246

Note: We obtained these numbers by multiplying the national aggregate numbers of ITC in 1986 by 15/7. This calculation is based on the following information and assumptions:

1. The regular ITC rate in 1986 for all provinces, other than the Atlantic, Gaspé, and other designated areas, is 7 per cent.
2. The regular ITC rate since 1989 for the Atlantic provinces is 15 per cent.
3. The capital stock weight of the Atlantic provinces is very small and hence can be virtually ignored in our calculation.

TABLE A.6
Statuatory Provincial Corporate Tax Rate (1991)

	General	Small business	Capital tax
Alberta	15.5	6.00	–
British Columbia	15.0	9.00	–
Manitoba	17.0	10.00	0.50
New Brunswick	17.0	9.00	–
Newfoundland	17.0	10.00	–
Nova Scotia	16.0	10.00	–
Ontario	14.5/15.5[a]	10.00	0.30
PEI	15.0	10.00	–
Quebec	6.9	3.75	0.56
Saskatchewan	15.0	10.00	0.50

a. Ontario gives a 1-per-cent rate reduction for all Ontario high income from manufacturing processing, farming, fishing, and logging.

TABLE A.7
Statuatory Provincial Corporate Tax Rate (1992)

	General	Small business	Capital tax
Alberta	15.5/15.0[a]	6.00	–
British Columbia	16.0	10.00	–
Manitoba	17.0	10.00	05.0
New Brunswick	17.0	9.00	–
Newfoundland	17.0	10.00	–
Nova Scotia	16.0	5.00	–
Ontario	14.5/15.5[b]	9.50	0.30
PEI	15.0	10.00	–
Quebec	8.9	5.75	0.56
Saskatchewan	17.0	9.00[c]	0.50

a. This rate effective 1 July, 1992
b. Ontario gives a 1-per-cent rate reduction for all Ontario high income from manufacturing processing, farming, fishing, and logging.
c. This rate effective 1 July 1992

Notes

The first draft of this paper was prepared for the Ontario Fair Tax Commission and completed in January 1993.

1 See McKenzie, Mintz, and Scharf 1992 for a new methodological approach for assessing the impact of taxation on the cost of production as applied to the transportation industry. The methodology allows for the aggregation of tax rates on various inputs, depending on the cost structure of the firm.

2 As an example, a project analysis prepared by Price Waterhouse (*Corporate Tax Comparisons: A Case Study Approach* [Ottawa: Ministry of Treasury and Economics 1991]) contrasts corporate tax burdens across jurisdictions. The analysis is based on a projected cash flow for a company that could operate in several jurisdictions. Unfortunately, it is difficult to compare the impact of tax systems using this type of analysis since comparative results depend on the assumed internal rate of return to the investment, which is calculated to be well above any required rate of return to capital. Jurisdictions with high statutory rates of corporate income tax could have high average corporate tax rates, as found by Price Waterhouse. Moreover, Price Waterhouse includes taxes on various inputs (e.g., payroll taxes) that are included in measuring the rate of return on an investment. There is no consideration of how

payroll taxes may be shifted back onto labour or how personal income taxes paid by individuals impact on input costs. Finally, the study is flawed in terms of aggregating taxes on various inputs. See McKenzie, Mintz, and Scharf 1992 for an alternative measure of effective tax rates on the marginal cost of production.

3 We assume interest-rate parity in our analysis: the nominal interest rate in Canada is equal to the nominal interest rate in a foreign country, plus the expected appreciation of the foreign currency relative to the Canadian currency. If purchasing-power parity holds for traded goods, then the foreign currency will appreciate by the difference in the Canadian and foreign-anticipated inflation rates. With purchasing-power parity, the real (risk-adjusted) interest rates will be the same across countries.

4 See Jog and Mintz 1989 for a comparison of the two approaches for incorporating risk in the cost of capital and effective tax rates. Note that the case of "income" risk is the same as the case of riskless investment in measuring the effective tax rate.

5 See McKenzie and Mintz 1992 for a presentation of U.S. and Canadian ETR comparisons for each of the alternative cases mentioned above.

6 We would expect that differences in statutory corporate tax rates would lead to different debt/asset ratios. Differences in statutory tax rates are not large across most of the provinces. The main exception is Quebec, which taxes most financial corporations at a rate that is about one-half of other provincial tax rates. Our expectation is that Quebec firms facing a very low corporate tax rate would have a low debt/asset ratio. If this were true, then Quebec's effective tax rates would be higher.

7 We note that the oil and gas industries are excluded from this analysis in addition to the mining industry. Boadway and McKenzie (1989) find that oil and gas industries are highly taxed as a result of the high provincial royalties assessed on these industries. We note that the high level of taxation of oil and gas, especially in Alberta, has allowed Alberta to tax corporations at a lower rate compared with those of other provinces.

8 When mining is included, British Columbia is less highly taxed. Note that British Columbia has a cash-flow tax on mining companies so that the only tax favourable to the mining sector is the federal corporate income tax.

9 Certain slow-growth regions outside the Atlantic provinces, primarily in Quebec, also qualify for the investment tax credit.

10 These ETRs imply that taxable income earned on marginal investments in mining is negative. For the effective tax rate to be negative, losses

on marginal investments must be claimed against income earned on inframarginal projects; otherwise, the rate cannot be negative at the margin. Note, in general, many mining firms tend to pay corporate and mining taxes on their capital, implying that there is full use of all tax write-offs on marginal investments.

11 Saskatchewan and Nova Scotia do have mining industries, but time limitations made it difficult for us to model the specific mining taxes in these two provinces.

12 According to the 1990 Ontario Budget, the original Ontario automatic resource allowance – which was 33.33 per cent – is being phased out in five years, beginning in 1989, and a new mining tax resource allowance – which will be 25 per cent in the fifth year (i.e., 1993) – would be phased in. Therefore, the overall effect is an annual decrease in allowance by 1.67 points.

13 The estimates are for "income" risky investments. See the definition put forward by Jog and Mintz (1989).

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2 Ontario's Corporate Income Tax

An Analysis of Effective Tax Rates

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Background

Considerable attention focuses on the taxes paid by corporations. Large firms[1] are often viewed as significant concentrations of wealth and power in society. Their incomes are very large, and many feel these firms should pay their "fair share" of tax.

What this fair share should be is very difficult to determine, in part because corporations are social constructions, institutions made up of many individuals acting as owners, managers, workers, suppliers, and customers. These institutions play a dynamic role in the economy, and adjust their behaviour in response not only to changing market opportunities, but also in response to the imposition of taxes and changes to tax provisions.

This paper examines the corporate income taxes levied on the earning income of corporations in Ontario and in Canada. However, for the reason just noted, the reader should be cautious about making the step from "levied" to "paid." Corporate income taxes, which are nominally levied on the profits of the firm, may in fact be borne by the owners of the firm in the form of lower after-tax profits. Alternatively, a corporation may shift the burden of its taxes to its workers by paying lower wages than it would in the absence of the tax, or to its customers by charging higher prices than it would otherwise have done.

This study is agnostic on the fundamental question of who ultimately bears the burden of corporate income taxes. Rather, it focuses on the initial question of the taxes nominally paid by corporations,

and the use of the word *paid* in the rest of this study should be understood to include this caveat.

This paper updates and elaborates a similar study by Wolfson (1988), in which it was found that the largest corporations paid less tax than both small and medium-sized corporations, and considerably less than the statutory rate would suggest. The basic explanation for these results was the disproportionate use by the largest firms of special tax provisions such as accelerated depreciation.

One question is whether this pattern was unique to that study (which examined data for 1983). Another is the extent to which it is attributable to Ontario corporate income tax law, as compared with federal tax provisions.

Methodology

The results in this analysis are based on a sample of approximately 24,000 federal corporate income tax returns for 1987. The sample is stratified by industry and by asset size in such a way that all the largest corporations (in terms of assets) are included. The information obtained from the tax returns includes income-statement and balance-sheet items as well as tax-related variables. The data are the same as those that underlie the annual Statistics Canada publications *Corporate Financial Statistics* (1987a) and *Corporate Taxation Statistics* (1987b). One major difference in methodology from that employed in these publications is related to the way in which the sample of 24,000 is "blown up" to represent the entire corporate universe. The Statistics Canada publications use a ratio-estimation procedure whereby major financial items such as sales and assets, which are collected on a universe basis, are used to estimate the remaining financial items of the non-sampled corporations.[2] This is a good technique for obtaining reliable aggregate totals – one that is ideally suited for the purposes of both of these publications. In this study, however, weights have been developed for each of the sampled corporations, based on a process of post-stratification, which allows individual corporations to be analysed directly. For example, using this method, it is possible to produce information on distributions of characteristics, such as the effective tax rate on which this analysis focuses.

An effective tax rate (ETR) is simply the ratio of taxes paid to income. Taxes (the numerator of the ETR) may refer to either federal or Ontario or other provincial corporate income taxes. Income (the denominator of the ETR) refers to benchmark income. This concept derives from tax-expenditure accounting (Minister of Finance 1978). It differs from

the conventional accounting concepts of book profit before or after tax. Benchmark income is defined as book profit before both current and deferred income taxes, and also before other taxes such as provincial capital and local property tax, and resource royalties. Benchmark income also excludes intercorporate dividends received, in order to prevent double-counting of income arising in the corporate sector.

An ETR can be computed for a group of corporations, producing an "aggregate ETR," or alternatively, it can be computed on a corporation-by-corporation basis, producing what we will call a "corporation ETR." Although both approaches have been used in this paper, most of the analyses are based on aggregate effective tax rates.

Aggregate ETRs are defined in the equation below. Some examples of class variables are net asset size, jurisdiction, and industry.

$$ETR_c = \frac{\sum_i tax_{ci}}{\sum_i binc_{ci}}$$

where c = class, i = firms within a given class, tax = taxes paid, binc = benchmark income.

In contrast, in order to determine median effective tax rates, for example, ETRs must be calculated at the firm level. The ETR of an individual corporation is given by the following equation:

$$ETR_i = \frac{tax_i}{binc_i}$$

where i = individual corporation, tax = taxes paid, binc = benchmark income.

The median or 75th-percentile ETR for a given group of corporations is then calculated by ranking the corporations in order of their corporation ETRs, and then finding the specific ETRs that are, respectively, halfway and three-quarters of the way along.

A significant extension made here of Wolfson's (1988) earlier analysis is the inclusion of provincial detail, with a focus on Ontario. This provincial disaggregation is based on the allocation formula in the Federal-Provincial Tax Collection Agreement.

Two caveats in relation to this allocation process must be kept in

mind. First, the statutory formula itself is arbitrary. Essentially, taxable income is prorated across provinces and territories, based (for most corporations) on a 50-50 weighted average of the provincial/territorial distribution of a corporation's wages and its sales. The resulting allocation of taxable income is used in this study to allocate other financial attributes, such as benchmark income. (Other variables, such as Ontario corporate income tax paid, are already allocated.) The second caveat concerns the allocation for those multi-jurisdictional firms that had no taxable income in 1987. These non-taxable corporations are not obliged to supply a provincial allocation of their wages and sales, even though they could well have had positive benchmark income (e.g., as a result of using accelerated depreciation). In these cases, the provincial allocation from a previous year has been used.

The following important concepts are used throughout this paper:

- Benchmark Income: book profit before current and deferred income taxes and indirect taxes less transfers and intercorporate dividends
- Net assets: assets net of intercorporate holdings
- Federal tax: federal part I corporate income tax
- Ontario tax: Ontario corporate income tax
- Effective tax rate (ETR): ratio of taxes paid to benchmark income
- Aggregate effective tax rate: ratio of aggregate taxes paid to aggregate benchmark income for a given class of corporations (see above)
- Corporation effective tax rate: ratio of taxes paid to benchmark income for an individual corporation (see above)

This study examines ETRs from a sequence of perspectives. We start with disaggregations by economic profitability since benchmark income rather than book profit is the concept that will be used. A corporation that has positive benchmark income is said to be "economically profitable" – a phrase that is used frequently in this paper. Corporate taxes are also examined from the perspective of the jurisdictions within which corporations earn income, and whether or not they paid any tax. The analysis then turns to disaggregations by net Canadian asset size (assets net of intercorporate holdings) and concludes with disaggregations by industrial sector.

Table 1 summarizes the distribution of the number of corporations by jurisdiction according to each of the three "subsets" of the corporate universe used in this paper: economically profitable corpora-

TABLE 1
Counts for Selected Corporate Universes, 1987

Jurisdiction	Benchmark income > 0	Benchmark income > 0 Federal income tax > 0	All corporations
Ontario only	167,760	116,359	231,986
Ontario multi	4,393	3,622	5,535
Ontario both	172,153	119,981	237,521
Other	273,137	164,377	402,989
All	445,290	284,358	640,510

tions, regardless of taxability; economically profitable and taxable corporations; and all corporations.

By jurisdiction, we mean the location of a firm's business activity. Corporations were categorized into those that had at least some economic activity in Ontario and those that did not (the "other" category in table 1). For the Ontario group, a further distinction was made between firms that were active only in Ontario (Ontario only) and those that had some economic activity in at least one province other than Ontario (Ontario multi-jurisdictional).

According to table 1, about two-thirds of all corporations were profitable in 1987, in the sense of having positive benchmark income. However, fewer than half paid any federal income tax.

Economic Activity by Jurisdiction, Economic Profitability, and Taxability

Table 2 gives an overview of Canadian corporate activity by jurisdiction. Examining the first row of table 2, we see that, of the 640,510 corporations active[3] in Canada in 1987, just over one-third (37.1 per cent or 237,521) had some activity (i.e., sales or wages) in Ontario. In turn, the vast majority (97.7 per cent) of these corporations had all of their activity in Ontario – 231,986. Only 5535 corporations with some economic activity in Ontario (2.3 per cent) also had economic activity in another province. This subset forms what we call Ontario multi-jurisdictional corporations in this study.

The 640,510 Canadian corporations received a total of $66.0 billion in 1987 (the second row of table 2). Note that multi-jurisdictional firms tend to be much larger than average, as is indicated by the fact that they account for as much benchmark income as the far more

TABLE 2
Benchmark Income, Federal Income Taxes Paid and Federal Aggregate ETR for All Corporations by Jurisdiction, National Totals, 1987

	Corporations with activity in Ontario				
	Ontario only	Ontario multi-jurisdictional	Both	Other corporations	All corporations
Count	231,986	5,535	237,521	402,989	640,510
Benchmark income ($ millions)	19,151	21,164	40,315	25,673	65,989
Federal income tax paid ($ millions)	2,841	4,292	7,133	5,037	12,170
Federal aggregate ETR	14.8	20.3	17.7	19.6	18.4

numerous Ontario-only firms – $21.2 versus $19.2 billion – notwithstanding their much smaller numbers.

Table 3 shows corresponding data for the subset of 237,521 firms with economic activity in Ontario. Most of the analysis to follow will concentrate on this group. Table 3 shows that, of the $21.2 billion in Canadian benchmark income received by Ontario multi-jurisdictional firms, only about half ($11 billion – second row, second column of table 3) was attributed to Ontario according to the formula in the Federal-Provincial Tax Collection Agreement.

Overall, corporations paid $12.2 billion in federal corporate income tax in 1987 (table 2). Of this, Ontario-only firms accounted for $2.8 billion, while multi-jurisdictional firms having some Ontario activity paid $4.3 billion. However, based on the allocation formula in the Tax Collection Agreement, only $2.2 billion of this latter amount should be considered to represent the Ontario portion (table 3, third row, second column). Ontario corporate income taxes amounted to just over half the volume of federal corporate income taxes based on the allocation formula – $2.8 billion versus $5.0 billion (table 3, third column). The relative percentages of corporate profits and taxes by jurisdiction are shown in figure 1.

In table 4, we go one step farther by differentiating economically profitable and taxable corporations as well as dividing them by jurisdiction. These concepts are of great interest because many corporations appear successful from an economic or shareholder perspective (i.e., have positive benchmark income or book profit) yet pay no income tax. This is perfectly legal, and tends to be the result of utilizing special incentive provisions in the corporate income tax system.

TABLE 3
Benchmark Income, Income Taxes Paid, and Aggregate ETRs for Corporations Active in Ontario by Jurisdiction, Ontario Portion, 1987

	Ontario only	Ontario multi-jurisdictional	Both
Count	231,986	5,535	237,521
Ontario benchmark income ($ millions)	19,151	11,040	30,191
Ontario federal income tax ($ millions)	2,841	2,205	5,046
Ontario income tax ($ millions)	1,518	1,232	2,750
Ontario federal aggregate ETR	14.8	20.0	16.7
Ontario aggregate ETR	7.9	11.2	9.1

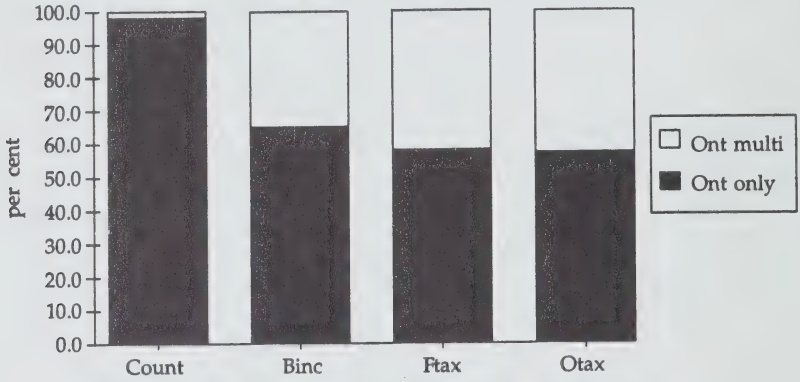
It does, however, raise questions about the appropriateness and effectiveness of these provisions.

Table 4 shows that about two-thirds of the 237,521 Ontario firms were economically profitable according to the financial data presented on their tax returns. This proportion is similar for non-Ontario firms (rows labelled "Other" in table 4). In turn, this implies that the $40.3 billion of aggregate benchmark income in Ontario firms is the net amount of $55.1 billion in positive benchmark income and $14.8 billion of benchmark income losses (table 4, eighth row). Turning to taxability, 52,172 Ontario corporations with $17.6 billion of positive benchmark income paid no federal taxes (second column, third and eighth rows).

Multi-jurisdictional firms had about the same volume of losses relative to positive benchmark income as Ontario-only firms (roughly $7 billion in each case, against a net total of roughly $20 billion each). However, among economically profitable firms, Ontario multi-jurisdictional firms tended more often to be taxable – 82.4 versus 69.4 per cent. Their federal aggregate ETRs were correspondingly higher – 14.9 versus 10.6 per cent (table 4, third column, fourth- and fifth-last rows).

Whether we consider only corporations with positive benchmark income, or those with positive benchmark income that are also federally taxable, or all corporations taken together, regardless of economic profitability or taxability, the pattern is the same: Ontario multi-jurisdictional corporations have the highest federal aggregate ETR. Ontario-only corporations have the lowest ETRs, with other corporations (those with no activity in Ontario) falling somewhere in-between (table 4, last section).

Figure 1
Percentage of Ontario Profits and Taxes by Jurisdiction, 1987



Effective Tax Rates by Net Asset Size

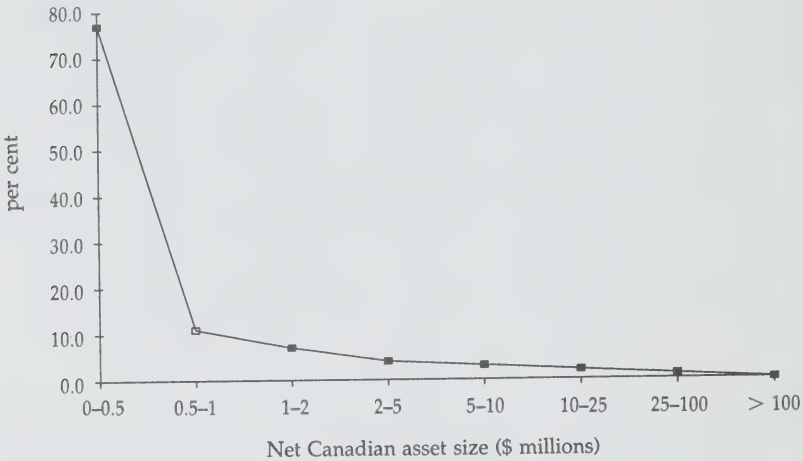
The lower ETRs of the Ontario-only firms may be associated with their smaller average size. The relationships with firm size are indicated in tables 7 through 10 and figures 2 through 9, where size, in all cases, is measured by the total assets of the corporation net of inter-corporate holdings.[4] Figure 2a gives the distribution of the number of Ontario corporations by net Canadian asset size. Similarly, figure 2b gives the distribution of Ontario benchmark income (the portion of a corporation's income allocated to Ontario) by asset size. The classic picture of a highly skewed distribution is apparent in these two graphs where about 75 per cent of all firms with economic activity in Ontario are in the smallest size range (figure 2a), yet they account for only about 20 per cent of the income (figure 2b). In contrast, the 0.25 per cent of firms in the top $100 million-plus net-asset size range received 42 per cent of the income.

Aggregate effective tax rates (ETRs) at the national level are given in table 5 and figure 3. The denominator in each size range is total benchmark income for all economically profitable corporations in that size range, that is, for those having positive benchmark income. The numerator of the ETR ratio is total income taxes paid by these same corporations – federal, to Ontario, or to other provinces. The results are quite similar to those reported for 1983 by Wolfson (1988). Corporate effective tax rates follow an inverted-U pattern. At most, Ontario and other provincial corporate income taxes appear to contribute

Benchmark Income, Income Taxes Paid and Federal Aggregate ETR for All Corporations by Jurisdiction, 1987

	Benchmark income > 0 / Federal income tax > 0	yes / yes	yes / no	yes / all	no / yes	no / no	no / all	all / all
Count	Ont only	116,359	51,401	167,760	1,933	62,293	64,226	231,986
	Ont multi	3,622	771	4,393	210	932	1,142	5,535
	Ont both	119,981	52,172	172,153	2,143	63,225	65,368	237,521
	Other	164,377	108,760	273,137	3,155	126,697	129,852	402,989
	All	284,358	160,932	445,290	5,298	189,922	195,220	640,510
Benchmark income (all Canada) ($ millions)	Ont only	15,831	10,676	26,506	−297	−7,057	−7,355	19,151
	Ont multi	21,635	6,933	28,568	−1,896	−5,508	−7,404	21,164
	Ont both	37,465	17,609	55,074	−2,193	−12,566	−14,759	40,315
	Other	25,390	16,058	41,448	−420	−15,355	−15,775	25,673
	All	62,855	33,667	96,522	−2,613	−27,920	−30,533	65,989
Federal income tax (all Canada) ($ millions)	Ont only	2,802	0	2,802	39	0	39	2,841
	Ont multi	4,259	0	4,259	33	0	33	4,292
	Ont both	7,061	0	7,061	72	0	72	7,133
	Other	4,826	0	4,826	212	0	212	5,037
	All	11,887	0	11,887	283	0	283	12,170
Ontario income tax ($ millions)	Ont only	1,452	44	1,496	19	2	22	1,518
	Ont multi	1,085	116	1,201	11	20	31	1,232
	Ont both	2,537	161	2,698	30	22	52	2,750
	Other	0	0	0	0	0	0	0
	All	2,537	161	2,698	30	22	52	2,750
Federal ETR (all Canada) ($ millions)	Ont only	17.7	0	10.6	N/A	N/A	N/A	14.8
	Ont multi	19.7	0	14.9	N/A	N/A	N/A	20.3
	Ont both	18.8	0	12.8	N/A	N/A	N/A	17.7
	Other	19.0	0	11.6	N/A	N/A	N/A	19.6
	All	18.9	0	12.3	N/A	N/A	N/A	18.4

Figure 2a
Distribution of Number of Ontario Firms Over Net Canadian Asset Size, 1987

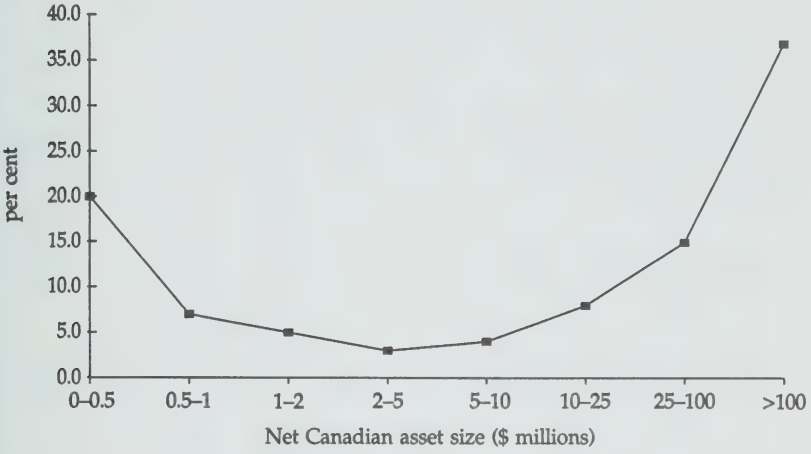


modestly to this overall national pattern, with the Ontario effective tax rate on the largest corporations at 2.6 or 2.7 per cent compared with 3.0 to 3.5 per cent in the middle size ranges. However, recall that the denominator in this case is national benchmark income.

Table 6 and figure 4 focus only on those corporations having some income allocated to Ontario, and only on the Ontario portions of benchmark income and federal tax. Here, the role of Ontario corporate income taxes is shown more clearly. They also follow an inverted-U pattern, but it is less pronounced than that for federal taxes. Ontario effective tax rates are lowest in the smallest asset size range at 5.0 per cent, followed by the largest asset size group at 6.6 per cent (compared with 7.1 per cent to 8.0 per cent in the intervening size ranges).

Of course, even within each of the asset size ranges, there is substantial variation in ETRs among individual corporations. This variation can be explored with "corporation ETRs" where the distribution of firm-specific ETRs within each asset size range is tabulated. Tables 7 and 8 and figures 5 and 6 show these results for federal and for Ontario corporate income taxes; in both cases, only the economically profitable firms are included, and only the Ontario portions of the relevant variables (other than assets). Leaving aside the smallest net

Figure 2b
Distribution of Ontario Benchmark Income Over Net Canadian Asset Size, 1987



Canadian asset size range, about one-tenth of Ontario corporate activity (in terms of numbers of corporations in each size range) paid federal tax at more than a 30 per cent ETR (from the 90th-percentile curve in figure 5 and the last row in table 7). In contrast, half of these corporations (the median figures) paid federal tax at ETRs of less than about 10 per cent, and at least one-quarter (the 25th percentile) had ETRs of zero – they paid no federal tax, though they were economically profitable. This contrasts with a federal statutory rate of 46 per cent prior to 1 July 1987 and 45 per cent thereafter. The operative federal tax rate, however, is much lower as a result of a number of deductions – the federal tax abatement, the small-business deduction, and the manufacturing and processing profits deduction being the largest. Not including the 10 per cent federal tax abatement or the 3 per cent surtax, the basic federal corporation rates were 38 per cent[5] for manufacturing corporations, 24 per cent for small non-manufacturing corporations, and 18 per cent for small manufacturing corporations.

Table 8 and figure 6 give the corresponding firm-specific ETRs for Ontario corporate income taxes paid. At least one-quarter of the firms in each net Canadian asset size range paid Ontario corporate income taxes at effective rates of at least 9 per cent, judging from the 75th-percentile corporation ETRs. In contrast, one-quarter of economically profitable firms in most size ranges paid no income taxes to Ontario

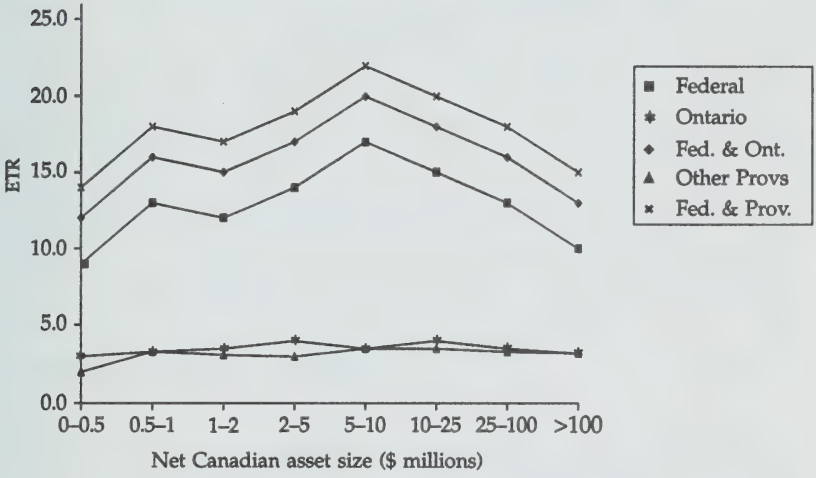
TABLE 5
Various Aggregate Effective Tax Rates (in percentages) by Net Canadian Asset Size for Economically Profitable Corporations, National Level, 1987

	Net Canadian asset size range ($ millions)								
	0–0.5	0.5–1	1–2	2–5	5–10	10–25	25–100	>100	All
Counts	332,469	56,710	28,000	17,151	5,154	3,194	1,718	894	445,290
Benchmark income ($ millions)	15,497	6,024	5,828	5,758	4,665	6,189	12,522	40,036	96,522
ETR – federal income tax	9.1	14.0	13.7	15.1	18.2	16.5	14.2	10.8	12.3
ETR – Ontario income tax	2.4	2.8	3.0	3.5	3.1	3.5	3.2	2.6	2.8
ETR – federal & Ontario income taxes	11.5	16.8	16.7	18.6	21.3	20.0	17.4	13.4	15.1
ETR – other provinces income taxes	1.6	2.9	2.5	2.4	3.0	3.0	2.6	2.7	2.5
ETR – federal & provincial income taxes	13.1	19.7	19.2	21.0	24.3	23.0	20.0	16.1	17.6

TABLE 6
Various Aggregate Effective Tax Rates (in percentages) by Net Canadian Asset Size for Economically Profitable Corporations, Ontario Economic Activity Only, 1987

	Net Canadian asset size range ($ millions)								
	0–0.5	0.5–1	1–2	2–5	5–10	10–25	25–100	>100	All
Counts	126,231	22,021	11,149	6,967	2,323	1,799	1,057	606	172,153
Ontario benchmark income ($ millions)	7,395	2,225	2,221	2,508	1,906	2,767	5,654	15,569	40,246
ETR – federal income tax	8.9	12.3	13.8	15.3	16.0	15.9	14.4	11.6	12.4
ETR – Ontario income tax	5.0	7.6	7.9	8.0	7.7	7.7	7.1	6.6	6.7
ETR – federal & Ontario income taxes	13.9	19.9	21.7	23.3	23.7	23.6	21.5	18.2	19.1

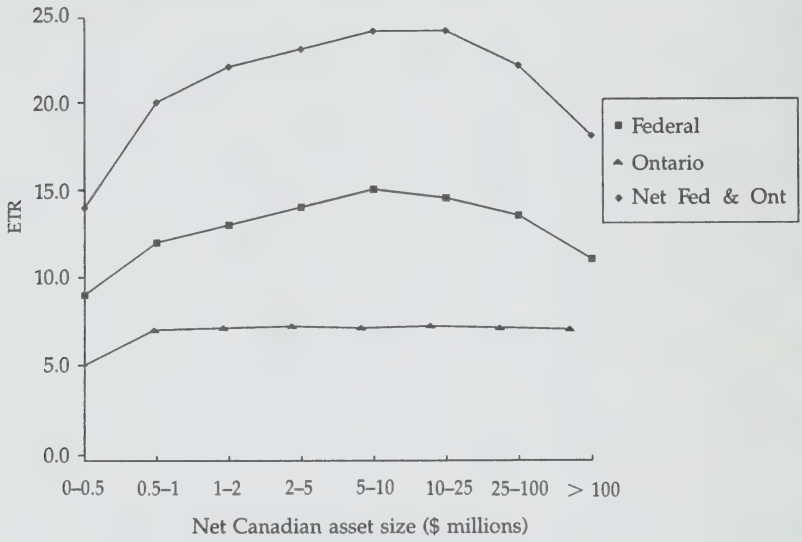
Figure 3
Aggregate Effective Tax Rates, National Level, 1987



(based on the 25th-percentile results). Unlike the aggregate ETR, the median ETR for Ontario corporate income taxes shows a generally rising trend with size. These various ETRs compare with a statutory Ontario rate in 1987 of 15.5 per cent.[6]

Table 9 shows the size-related pattern of federal aggregate ETRs for corporations active in Ontario disaggregated by the economic profitability and taxability status of the corporations in each size range. For more detail, refer to table A in appendix A. Figure 7, which is drawn from data in table 9, shows the sensitivity of the aggregate federal ETR (Ontario portion) to the specific universe of firms being considered. The results up to this point have focused on firms with positive benchmark income (referred to as "binc +" in the table), irrespective of whether or not they paid any tax. This corresponds to the lowest curve in figure 7. Narrowing our universe further, to include only the subset of these firms that paid at least some federal income tax ("ftax +" in table 9), naturally results in somewhat higher ETRs. Going the other way: if the universe includes all firms, ETRs also rise, but this time losses offset the positive benchmark income of the economically profitable firms, thereby reducing the magnitudes of the ETR denominators. These variations show the importance of disaggregating firms by economic profitability in order to have a clear picture of effective corporate income taxation.

Figure 4
Aggregate Effective Tax Rates, Ontario Activity Only, 1987



Effective Tax Rates by Net Asset Size and Jurisdiction

Another perspective is given by table 10. Economically profitable corporations are broken down by jurisdiction as well as by size. Keep in mind that by selecting only economically profitable firms, irrespective of taxability, we are consistent with the viewpoint that the corporate tax system, in principle, imposes a zero tax rate on losses (i.e., no refundability), and only positive benchmark income should, therefore, be in the tax base. Figure 8 shows that the large majority of corporations have positive benchmark income and that multi-jurisdictional firms are more likely to be economically profitable in all but the smallest size ranges.

Table 10 and figure 9 show that multi-jurisdictional firms have higher federal aggregate ETRs than Ontario-only firms for all asset size groups. The $10 million – $25 million (in assets) multi-jurisdictional firms had the highest federal ETR, at 25.1 per cent, compared with the over $100 million (in assets) Ontario-only group, at 7.2 per cent. In addition, both curves show a generally inverted-U pattern

TABLE 7
Distribution of Corporation Effective Tax Rates by Net Canadian Asset Size for Economically Profitable Ontario Corporations, Federal Income Tax, 1987

Effective tax rates	Net Canadian asset size range ($ millions)							
	0–0.5	0.5–1	1–2	2–5	5–10	10–25	25–100	>100
25th percentile	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
median	10.4	12.5	12.0	9.8	9.5	7.9	7.0	0.1
75th percentile	15.4	16.3	16.5	19.0	25.9	27.4	28.3	23.2
90th percentile	20.0	32.8	31.1	32.5	36.9	35.3	36.0	34.2

with size. Looking at the numbers in table 10, a similar pattern holds true for Ontario aggregate ETRs.

Effective Tax Rates by Industry

Tables 11 and 12 give basic results by broad industrial sector for economically profitable Ontario corporations (industry definitions and more detailed results are given in appendix A). There is substantial variation in aggregate ETRs by industry, with the resource sector having the lowest federal rate, and the finance sector the lowest Ontario rate. The highest rates are found in the construction, transportation, and utilities sector (hereafter referred to as "construction") for the federal rate (17.4 per cent) and the manufacturing sector for the Ontario rate (10.0 per cent).

Classifying corporations according to their industrial activity must include the following caveat. We have based our industrial groupings on the 1960 Standard Industrial Classification (SIC) System.[7] Since the SIC System was designed to classify establishments rather than corporations, it is difficult to assign a single SIC code to a corporation that may be involved in more than one industrial activity. In these cases, the SIC code corresponding to the activity that accounts for the largest amount of revenue is assigned.

The ETRs in table 12 are calculated by taking the Ontario portions of benchmark income for the denominator and federal taxes for the numerator, respectively. (Note, however, that the benchmark income given in table 11 is the national figure.) From the federal point of view, there is a rather large disparity between the ETRs for multi-jurisdictional firms and Ontario-only ones for the following three sectors: construction, transportation, and utilities; trade; and service.

TABLE 8
Distribution of Corporation Effective Tax Rates by Net Canadian Asset Size for Economically Profitable Ontario Corporations, Ontario Income Tax, 1987

Effective tax rates	Net Canadian asset size range ($ millions)							
	0–0.5	0.5–1	1–2	2–5	5–10	10–25	25–100	>100
25th percentile	0.0	0.0	3.5	4.2	1.1	0.0	0.0	0.0
median	6.1	8.1	7.9	8.1	7.6	8.0	9.0	6.5
75th percentile	9.1	10.1	9.8	10.4	13.1	13.7	14.3	13.3
90th percentile	10.1	13.9	12.5	14.8	15.5	15.5	16.4	16.9

Except for the service sector, the differences in ETRs for Ontario-only and multi-jurisdictional firms are much less pronounced from the Ontario perspective.

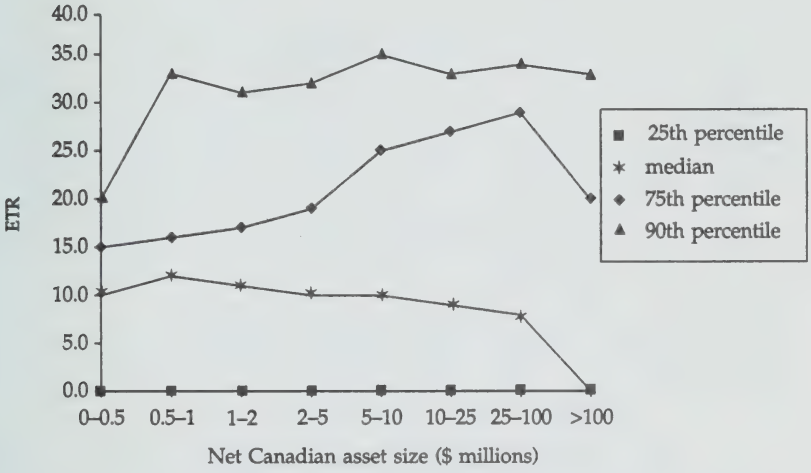
Summary and Concluding Comments

Private-sector corporate activity in Ontario generated about $30 billion in benchmark income in 1987, as shown in table 9 (last column). This amount is the result of netting $10 billion of benchmark losses against $40 billion of positive benchmark income. These income flows gave rise to $5.1 billion and $2.8 billion in federal and Ontario corporate income taxes, respectively. There were 52,000 Ontario corporations with positive benchmark income that paid no tax (table 4). The overall effective Ontario corporate tax rate was 6.7 per cent (table 6), compared with a statutory tax rate of 15.5 per cent. The difference between the statutory and effective tax rates is attributable to a variety of special tax provisions such as incentives for investment and a special low tax rate for small businesses.

Effective tax rates are quite variable across different groupings of corporations. With regard to size, corporations in the middle size ranges ($2 million to $25 million in net Canadian assets) faced the highest rates. Small and large firms paid tax at lower rates. Bearing in mind their small numbers but larger-than-average size, multi-jurisdictional firms with activity in Ontario paid $1.2 billion in Ontario corporate income taxes compared with $1.5 billion for Ontario-only firms.

Effective tax rates also vary substantially across industrial groups. From a federal perspective, the resource sector paid at the lowest rates (7.4 per cent), while, from the perspective of the Ontario corporate income system, the finance sector had the lowest effective tax rates

Figure 5
Corporation Effective Tax Rates by Size, Net Federal Income Tax, 1987

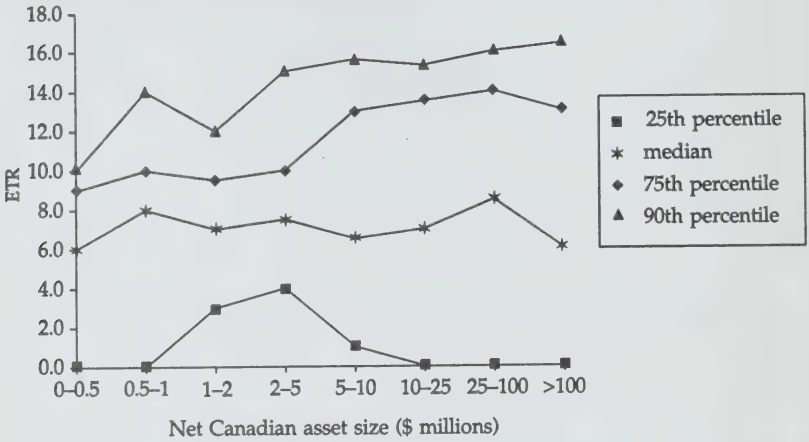


(4.0 per cent). These variations are generally attributable to differential utilization of tax expenditure and related provisions.

These broad results are similar to an earlier analysis of 1983 corporate income tax data (Wolfson 1988). A key question is whether these results for 1987 are indicative of the general patterns to be expected in the 1990s. One source of change is the 1987 corporate income tax reform and the introduction in 1989 of the Large Corporations Tax. Castonguay and Holland (1991, 33) conclude in this connection that "tax reform has made significant improvements ... More profitable corporations pay tax."

According to projections contained in the 1987 federal budget paper *Income Tax Reform* (Minister of Finance 1987b, 67), the net impact of the 1987 reforms broadening the corporate income tax base and reducing the statutory corporate income tax rate would be to raise federal revenues by $1.2 billion to $1.6 billion in 1990–92. At the same time, it should be borne in mind that the 1987 budget also forecast average annual GDP growth of 3.0 per cent and an average unemployment rate of 8.0 per cent over the 1989–92 period (Minister of Finance 1987a, 25) when, in fact, these rates averaged about 1 and 9.5 per cent, respectively. As a result of the weaker economy than forecast, the 1987 revenue-impact projections associated with corporate income tax reform may be high.

Figure 6
Corporation Effective Tax Rates by Size, Ontario Income Taxes, 1987



Subsequently, the Large Corporations Tax was introduced and the corporate income surtax was amended in the 1989 budget, and these changes were forecast to raise about $1 billion in new revenues, particularly from the financial sector (Minister of Finance 1989, 59). However, by the time of the 1990 federal budget, the overall corporate income tax revenue forecast for 1990–91 was revised downward by $2.4 billion. After this revision, corporate income tax revenues for 1991–92 were forecast to be $13.6 billion (Minister of Finance 1990, 106–8).

These figures can be compared with estimates from the System of National Accounts on federal income tax paid and profits before taxes[8] as well as investment, shown in table 13. Profits have declined sharply since 1989, the 1991 and 1992 figures being less than half the 1987 value; tax revenues in 1991 were more than $4 billion below the 1990 budget forecast. At the same time, aggregate effective tax rates have increased markedly, from around 20 per cent in 1987–89 to over 34 per cent in 1991–92.

One explanation for the increase in effective tax rates is the corporate tax reform measures just noted. Another might have been associated with a fall in business investment, and, hence, a decline in utilization of the remaining investment incentives in the tax system. However, this latter possibility is belied by the relative stability in aggregate investment shown in the right-hand column of table 13.

TABLE 9
Counts, Benchmark Income, Federal Taxes Paid, and Federal Aggregate ETRs (in percentages) for Corporations Active in Ontario by Asset Size, Economic Profitability, and Taxability, 1987

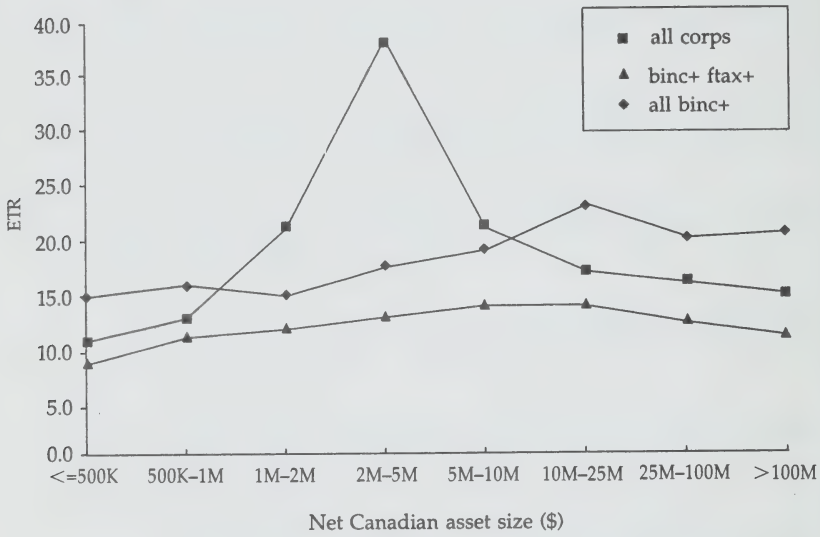
Variable	Universe	Net Canadian asset size range ($ millions) 0–0.5	0.5–1	1–2	2–5	5–10	10–25	25–100	>100	All
Count	overall	182,153	26,036	13,573	8,462	2,928	2,286	1,354	729	237,521
	binc+	126,231	22,021	11,149	6,967	2,323	1,799	1,057	606	172,153
	binc+, ftax+	85,796	16,194	8,659	5,482	1,590	1,223	690	347	119,981
Ontario benchmark income ($ millions)	overall	6,087	1,893	1,426	1,000	1,314	2,283	4,724	11,465	30,191
	binc+	7,395	2,225	2,221	2,508	1,906	2,767	5,654	15,569	40,246
	binc+, ftax+	4,345	1,701	1,917	2,030	1,484	1,902	4,106	8,827	26,312
Ontario federal income tax ($ millions)	overall	664	277	318	390	309	441	821	1,825	5,046
	binc+	658	275	306	384	305	440	813	1,806	4,987
	binc+, ftax+	658	275	306	384	305	440	813	1,806	4,987
Federal ETR	overall	10.9	14.7	22.3	39.0	23.5	19.3	17.4	15.9	16.7
	binc+	8.9	12.3	13.8	15.3	16.0	15.9	14.4	11.6	12.4
	binc+, ftax+	15.1	16.2	16.0	18.9	20.5	23.1	19.8	20.5	19.0

TABLE 10
Counts, Benchmark Income, Taxes Paid, and Various Aggregate ETRs (in percentages) for Economically Profitable Corporations by Asset Size and Jurisdiction, 1987

Variable	Jurisdiction	Net Canadian asset size range ($ millions) 0–0.5	0.5–1	1–2	2–5	5–10	10–25	25–100	>100	All
Count	Ont only	125,615	21,720	10,572	6,245	1,754	1,199	471	184	167,760
	Ont multi	616	301	577	722	569	600	586	422	4,393
	Ont both	126,231	22,021	11,149	6,967	2,323	1,799	1,057	606	172,153
	Other	206,238	34,689	16,851	10,184	2,831	1,395	661	288	273,137
	All	332,469	56,710	28,000	17,151	5,154	3,194	1,718	894	445,290
Ontario income ($ millions)	Ont only	7,372	2,205	2,155	2,352	1,602	2,085	2,789	5,947	26,506
	Ont multi	52	33	132	352	603	1,280	4,775	21,342	28,568
	Ont both	7,424	2,238	2,287	2,704	2,205	3,365	7,564	27,289	55,074
	Other	8,073	3,787	3,542	3,055	2,461	2,825	4,959	12,747	41,448
	All	15,497	6,024	5,828	5,758	4,665	6,189	12,522	40,036	96,522
Federal tax ($ millions)	Ont only	654	272	294	348	231	264	309	430	2,802
	Ont multi	10	5	29	74	128	321	917	2,776	4,259
	Ont both	663	277	323	422	359	585	1,227	3,206	7,061
	Other	755	565	473	450	491	438	549	1,106	4,826
	All	1,418	842	796	872	850	1,023	1,776	4,311	11,887
Ontario tax ($ millions)	Ont only	369	168	169	182	112	132	155	209	1,496
	Ont multi	2	2	6	18	25	82	244	812	1,201
	Ont both	371	170	176	200	147	214	399	1,022	2,698
	Other	0	0	0	0	0	0	0	0	0
	All	371	170	176	200	147	214	399	1,022	2,698

Federal ETR	Ont only	8.9	12.3	13.6	14.8	14.4	12.7	11.1	7.2	10.6
	Ont multi	18.2	14.4	22.1	20.9	21.3	25.1	19.2	13.0	14.9
	Ont both	8.9	12.4	14.1	15.6	16.3	17.4	16.2	11.7	12.8
	Other	9.3	14.9	13.3	14.7	20.0	15.5	11.1	8.7	11.6
	All	9.1	14.0	13.7	15.1	18.2	16.5	14.2	10.8	12.3
Ontario ETR	Ont only	5.0	7.6	7.8	7.8	7.0	6.3	5.6	3.5	5.6
	Ont multi	4.1	5.2	4.9	5.1	5.8	6.4	5.1	3.8	4.2
	Ont both	5.0	7.6	7.7	7.4	6.7	6.4	5.3	3.7	4.9
	Other	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	All	2.4	2.8	3.0	3.5	3.1	3.5	3.2	2.6	2.8

Figure 7
Aggregate Federal Effective Tax Rates by Net Canadian Asset Size, Profitability and Taxability – Ontario Firms, 1987

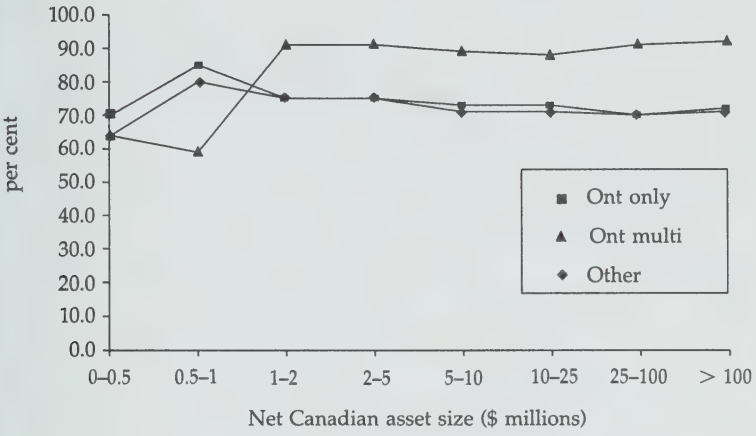


Other explanations might be related to the varying availability of tax losses to be carried forward or back.

These figures illustrate the difficulty of forecasting corporate profits and tax revenues. They also make clear that changes in the macro economy have generally larger impacts on corporate tax revenues than do the recent changes in tax policy. The 1987 and 1989 budget forecasts implied that corporate tax changes should raise revenues by about $2.5 billion by 1992, while, in fact, these revenues have declined by about $3 billion. That is not to imply that the revenue-raising impact of the tax changes was incorrectly estimated. It is entirely possible that, without the reforms in the late 1980s, actual corporate tax revenues would have been correspondingly lower.

The main conclusion is that it is very difficult, in projecting the volume of corporate income tax revenues, let alone their distribution among corporations of various types, to disentangle changes in tax structure from changes in the macro economy. More definitive results will have to await more detailed and current data.

Figure 8
Percentage of All Corporations Having Positive Benchmark Income, 1987



Appendix A: Determination of Weights

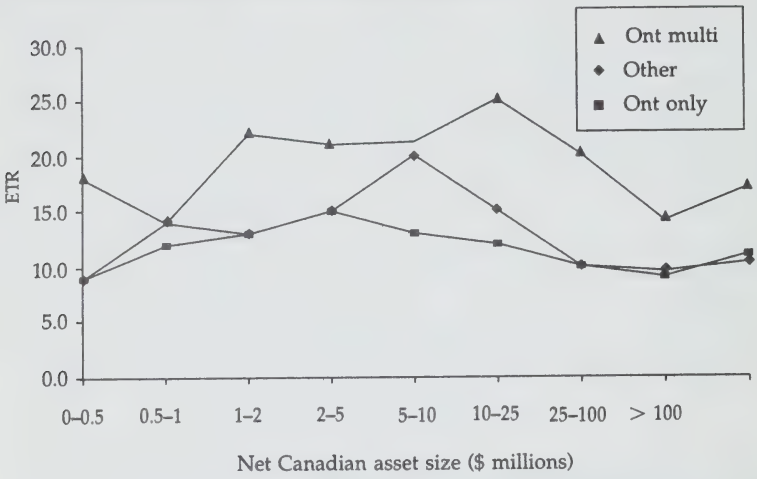
1. Data Sources

The Industrial Organization and Finance Division (IOFD) of Statistics Canada receives corporate income tax data from Revenue Canada, Taxation, on an ongoing basis. These data are edited and compiled and become the basis for their annual publications *Corporation Financial Statistics* (Cat. no. 61-207) and *Corporation Taxation Statistics* (Cat. no. 61-208). They are also the primary data source for our analyses.

Each year,[9] the IOFD receives from Revenue Canada a stratified sample of corporation records that are drawn from the universe of corporations filing a tax return. These records, which are stratified[10] according to industry (1960 SIC code) and asset size, contain detailed financial and taxation information about a corporation. Six levels of asset size are considered: $25 million and more, $10 million – $25 million, $5 million – $10 million, $1 million – $5 million, $0.25 million – $1 million, and under $0.25 million.

Included in the sample with certainty are the "take-alls" (corporations with assets of $25 million or more, and all federal and provincial Crown corporations) and all corporations that fall in a strata with eight members or fewer. Random systematic sampling from the

Figure 9
Aggregrate Effective Tax Rates for Positive Benchmark Income Firms by Jurisdiction and Net Canadian Asset Size, 1987



other strata round out the sample ("take-some" categories). Excluded from this process are those corporations considered to be inactive (corporations with assets less than $50,000 and sales less than $10,000). These sampled records formed the basis of our research.

In order to derive a provincial dimension, we used a supplementary taxable-income allocator file provided by the IOFD. The IOFD receives from Revenue Canada data on the provincial allocation of a corporation's taxable income for all corporations that have positive taxable income[11] in the current taxation year. For the remainder of the corporations, those which report either zero or negative taxable income, Revenue Canada has estimated the provincial allocator, based on a previous year's data. This taxable-income allocator is used as a proxy for obtaining financial and taxation corporation data at the provincial level.

2. *Methodology*

Since we were starting with IOFD sampled records, it was necessary to develop a set of sampling rates in order to make estimates for the total population. Take-alls and all federal and provincial Crown corporations are treated as being sampled with certainty and assigned a

TABLE 11
Counts and Benchmark Income for Economically Profitable Ontario Corporations by Industry and Jurisdiction, 1987

Industry	Counts				Benchmark income ($ millions)			
	Ont only	Ont multi	Other	All	Ont only	Ont multi	Other	All
resource	5,770	71	18,228	24,069	992	5,740	5,678	12,409
manuf	13,225	1,406	19,521	34,152	3,415	11,726	6,393	21,534
construction	25,614	364	42,297	68,275	2,420	3,131	7,083	12,634
trade	38,289	1,498	66,425	106,212	3,544	3,324	6,632	13,500
finance	47,298	474	69,686	117,458	13,058	3,935	11,315	28,308
services	37,564	580	56,980	95,124	3,077	711	4,347	8,136
all	167,760	4,393	273,137	445,290	26,506	28,568	41,448	96,522

TABLE 12
Federal and Ontario Aggregate ETRs for Economically Profitable Ontario Corporations by Industry and Jurisdiction, 1987

	Federal aggregate ETRs			Ontario aggregate ETRs		
Industry	Ont only	Ont multi	Both	Ont only	Ont multi	Both
resource	7.7	7.2	7.4	4.8	5.6	5.3
manuf	16.0	16.7	16.5	9.8	10.2	10.0
construction	14.2	22.2	17.4	8.0	10.4	8.9
trade	11.3	21.3	14.7	6.3	9.8	7.4
finance	8.6	8.9	8.6	4.0	4.2	4.0
services	10.3	24.2	11.8	5.8	11.9	6.5
all	10.6	15.9	12.4	5.6	8.7	6.7

weight of one. For the take-some categories, weights are assigned based on information provided by one of the fields found on the publication file received from the IOFD. This field contains information about the 1960 SIC code that was assigned to the corporation, the stratum type that it belongs to (Crown take-all, take-all by asset size, take-some), and the stratum number it was given in order to differentiate between asset sizes.

Once the strata had been identified, it was necessary to further differentiate within strata between sampled and non-sampled corporations. The weights, which were just the inverses of the sampling rates, were then calculated according to the formula

$$w = \frac{(n_s + n_{ns})}{n_s} = \frac{n}{n_s}$$

where n_s = number of sampled corporations
n_{ns} = number of non-sampled corporations
$n = n_s + n_{ns}$

We found that the agreement between our weighted file and the universe file deteriorated as we moved to smaller asset size groups. This finding is not surprising since the sampling rate decreases as the asset size becomes smaller. We then decided to take a closer look at the smallest asset group to see if we could identify the problem.

Initially, we chose a half-dozen or so strata from the more than 400 strata with assets less than $250,000. These strata were selected because the weighted sales figures were substantial and many times

TABLE 13
Corporation Federal Corporate Income Tax, Profits, and Investment Canadian System of National Accounts, 1987–1992[a]

Year	Federal corporate income tax ($ billions)	Profits before taxes ($ billions)	Federal income tax/Profits (per cent)	Investment in business plant and equipment ($ billions)
1987	11.7	53.9	21.8	64.3
1988	11.8	63.5	18.5	75.2
1989	12.7	54.9	23.1	81.6
1990	11.5	38.7	30.0	80.4
1991	9.4	25.2	37.2	74.5
1992	9.5	27.3	34.6	71.7

greater than the corresponding universe figures. In each of these cases, the overrepresentation of a stratum's sales was caused by the dominance of a single firm. We decided to create a substratum that would single out the outliers. The criterion we used was the ratio of a firm's sales to the average sales of its stratum; if this ratio was above a certain threshold, we banished it to the "special cases" substratum. Each of these corporations were retained in our database and assigned a weight of one.

$$rsale = \frac{S_i}{sbar} = n \times \frac{S_i}{s}$$

where s = total sales of the stratum
s_i = individual firm's sales
$sbar$ = stratum mean sales
n = number of firms in the stratum

3. Verification

As shown in table A, our "weighted" figures compare favourably with the published totals for the so-called five majors and the total number of corporations found in the Statistics Canada publications *Corporation Financial Statistics 1987* (Cat. no. 61-207) and its sister publication *Corporation Taxation Statistics 1987* (Cat. no. 61-208) for the taxation year 1987. The distinction between the columns titled "Published" and "Publication File" is that the latter is a machine-

TABLE A
Comparison of Weighted Data and Published Data

Variable	Published	Publication file	Weighted data
Count	606,562	642,602	640,510
Sales ($ millions)	–	1,055,603	1,125,691
Assets ($ millions)	1,887,537	1,902,890	1,907,395
Equity ($ millions)	584,261	585,919	581,200
Profits ($ millions)	85,850	86,521	88,294
Taxable income ($ millions)	31,390	31,926	36,104

readable file that has been updated since the figures were originally published. This explains the slight differences in values between these two columns. Unfortunately, there is no published figure that corresponds to "Sales."

4. Industrial Sectors

Table B gives the relationship between the industrial sectors used in this paper and the corresponding code in the SIC System. The left side of the table gives the aggregate sectors used for the analysis in the main body of the paper. The right side gives the slightly more detailed breakdown used for the tables presented in appendix B.

Appendix B: Detailed Tables

TABLE B
Aggregate Industrial Sectors and Their Corresponding SIC Codes

Aggregate Sectors	SIC Codes	More detailed sectors	SIC Codes
Resource sector	SIC ≤ 99,	agriculture, forestry, fishing	SIC ≤ 47
	365 ≤ SIC ≤ 369	mining	51 ≤ SIC ≤ 60, 65 ≤ SIC ≤ 99
		energy	61 ≤ SIC ≤ 64, 365 ≤ SIC ≤ 369
Manufacturing	100 ≤ SIC ≤ 364 370 ≤ SIC ≤ 399	manufacturing	100 ≤ SIC ≤ 364 370 ≤ SIC ≤ 399
Construction, transp. & utilities	404 ≤ SIC ≤ 579	construction	404 ≤ SIC ≤ 421
		transportation & utilities	422 ≤ SIC ≤ 579
Trade	602 ≤ SIC ≤ 699	wholesale	602 ≤ SIC ≤ 629
		retail	630 ≤ SIC ≤ 699
Finance	712 ≤ SIC ≤ 793	banks	712 ≤ SIC ≤ 718
		other financial	719 ≤ SIC ≤ 793
Services	801 ≤ SIC ≤ 899	services	801 ≤ SIC ≤ 899

TABLE B1

Benchmark Income, Federal Taxes Paid, and Federal ETR by Asset Size, Economic Profitability, and Federal Taxability

Positive benchmark income	Positive federal tax	Asset size	Ontario benchmark Count	Ontario benchmark income ($ millions)	Ontario federal tax ($ millions)	Federal ETR
All	All	< = 500K	182,153	6,087	664	10.9
All	All	500K – 1M	26,036	1,893	277	14.7
All	All	1M – 2M	13,573	1,426	318	22.3
All	All	2M – 5M	8,462	1,000	390	39.0
All	All	5M – 10M	2,928	1,314	309	23.5
All	All	10M – 25M	2,286	2,283	441	19.3
All	All	25M – 100M	1,354	4,724	821	17.4
All	All	> 100M	729	11,465	1,825	15.9
All	All	All	237,521	30,191	5,046	16.7
All	no	< = 500K	95,172	1,826	0	
All	no	500K – 1M	9,441	209	0	
All	no	1M – 2M	4,694	–9	0	
All	no	2M – 5M	2,747	–1,005	0	
All	no	5M – 10M	1,301	–34	0	
All	no	10M – 25M	1,027	394	0	
All	no	25M – 100M	646	656	0	
All	no	> 100M	369	2,677	0	
All	no	All	115,397	4,713	0	
All	yes	< = 500K	86,981	4,261	664	
All	yes	500K – 1M	16,595	1,684	277	
All	yes	1M – 2M	8,879	1,435	318	
All	yes	2M – 5M	5,715	2,005	390	
All	yes	5M – 10M	1,627	1,348	309	
All	yes	10M – 25M	1,259	1,889	441	

TABLE B1 *continued*
Benchmark Income, Federal Taxes Paid, and Federal ETR by Asset Size, Economic Profitability, and Federal Taxability

Positive benchmark income	Positive federal tax	Asset size	Ontario benchmark Count	Ontario benchmark income ($ millions)	Ontario federal tax ($ millions)	Federal ETR
All	yes	25M – 100M	708	4,068	821	
All	yes	> 100M	360	8,788	1,825	
All	yes	All	122,124	25,478	5,046	
no	All	< = 500K	55,922	–1,308	6	
no	All	500K – 1M	4,015	–333	3	
no	All	1M – 2M	2,424	–796	11	
no	All	2M – 5M	1,495	–1,508	6	
no	All	5M – 10M	605	–593	5	
no	All	10M – 25M	487	–485	1	
no	All	25M – 100M	297	–930	8	
no	All	> 100M	123	–4,103	19	
no	All	All	65,368	–10,055	59	
yes	All	< = 500K	126,231	7,395	658	8.9
yes	All	500K – 1M	22,021	2,225	275	12.3
yes	All	1M – 2M	11,149	2,221	306	13.8
yes	All	2M – 5M	6,967	2,508	384	15.3
yes	All	5M – 10M	2,323	1,906	305	16.0
yes	All	10M – 25M	1,799	2,767	440	15.9
yes	All	25M – 100M	1,057	5,654	813	14.4
yes	All	> 100M	606	15,569	1,806	11.6
yes	All	All	172,153	40,246	4,987	12.4
no	no	< = 500K	54,737	–1,224	0	
no	no	500K – 1M	3,614	–316	0	
no	no	1M – 2M	2,204	–313	0	
no	no	2M – 5M	1,262	–1,483	0	
no	no	5M – 10M	568	–457	0	

no	no	10M – 25M	451	–471	0	
no	no	25M – 100M	279	–891	0	
no	no	> 100M	110	–4,064	0	
no	no	All	63,225	–9,220	0	
no	yes	< = 500K	1,185	–84	6	
no	yes	500K – 1M	401	–17	3	
no	yes	1M – 2M	220	–482	11	
no	yes	2M – 5M	233	–25	6	
no	yes	5M – 10M	37	–136	5	
no	yes	10M – 25M	36	–13	1	
no	yes	> 25M	31	–78	27	
no	yes	All	2,143	–834	59	
yes	no	< = 500K	40,435	3,050	0	
yes	no	500K – 1M	5,827	524	0	
yes	no	1M – 2M	2,490	304	0	
yes	no	2M – 5M	1,485	479	0	
yes	no	5M – 10M	733	423	0	
yes	no	10M – 25M	576	865	0	
yes	no	25M – 100M	367	1,548	0	
yes	no	> 100M	259	6,741	0	
yes	no	All	52,172	13,934	0	
yes	yes	< = 500K	85,796	4,345	658	15.1
yes	yes	500K – 1M	16,194	1,701	275	16.2
yes	yes	1M – 2M	8,659	1,917	306	16.0
yes	yes	2M – 5M	5,482	2,030	384	18.9
yes	yes	5M – 10M	1,590	1,484	305	20.5
yes	yes	10M – 25M	1,223	1,902	440	23.1
yes	yes	25M – 100M	690	4,106	813	19.8
yes	yes	> 100M	347	8,827	1,806	20.5
yes	yes	All	119,981	26,312	4,987	19.0

Table B2
Detailed Table of Various Aggregate All Canada Effective Tax Rates (in per cent) by Industry and Net Asset Size, 1987

Industry	Asset Size	Count	Federal	Ontario	Fed & Ont	Other Prov	Fed & Prov
all	0–0.5	332,469	9.1	2.4	11.5	1.6	13.2
all	0.5–1	56,710	13.9	2.8	16.7	2.9	19.6
all	1–2	28,000	13.5	3.0	16.5	2.5	18.9
all	2–5	17,151	14.7	3.5	18.2	2.4	20.6
all	5–10	5,154	18.0	3.1	21.1	3.0	24.2
all	10–25	3,194	16.4	3.5	19.8	3.0	22.9
all	25–100	1,718	14.0	3.2	17.2	2.6	19.7
all	>100	894	8.7	2.6	11.3	2.7	14.0
all	all	445,290	11.4	2.8	14.2	2.5	16.7
agriculture	0–0.5	12,824	8.4	1.9	10.4	3.5	13.9
agriculture	0.5–1	3,996	8.5	2.8	11.3	2.6	13.9
agriculture	1–2	1,697	4.9	2.8	7.6	2.6	10.2
agriculture	2–5	676	14.0	4.0	18.0	2.8	20.9
agriculture	5–10	77	10.2	1.4	11.6	4.0	15.5
agriculture	>10	42	14.0	4.7	18.7	1.9	20.6
agriculture	all	19,312	8.8	2.7	11.5	3.0	14.4
mining	0–.0.5	1,888	7.4	0.8	8.3	2.9	11.1
mining	0.5–1	351	10.4	0.0	10.4	6.8	17.1
mining	1–2	195	11.4	4.6	16.0	3.3	19.4
mining	2–5	290	16.7	1.5	18.2	3.5	21.7
mining	5–10	56	10.7	2.0	12.6	3.1	15.7
mining	10–25	43	9.1	2.1	11.1	2.4	13.5
mining	25–100	41	13.4	3.6	17.0	2.7	19.6
mining	>100	37	2.6	1.2	3.8	1.2	5.0
mining	all	2,901	4.9	1.5	6.4	1.7	8.1
energy	0–0.5	913	2.8	1.1	3.9	0.7	4.5

energy	0.5–1	265	6.6	0.0	6.6	2.5	9.1
energy	1–2	154	4.4	0.0	4.4	1.5	5.9
energy	2–5	240	5.9	1.2	7.1	3.1	10.1
energy	5–10	49	11.6	0.0	11.6	5.2	16.8
energy	10–25	73	3.9	0.9	4.8	1.6	6.4
energy	25–100	90	10.1	0.2	10.2	5.1	15.3
energy	>100	72	8.4	0.6	9.1	4.3	13.4
energy	all	1,856	8.4	0.6	9.0	4.3	13.4
manuf	0–0.5	19,982	7.3	2.8	10.1	1.6	11.8
manuf	0.5–1	4,977	8.7	3.6	12.3	2.2	14.5
manuf	1–2	3,046	11.0	4.1	15.1	2.5	17.6
manuf	2–5	3,355	15.0	3.7	18.8	2.6	21.4
manuf	5–10	1,210	19.9	4.6	24.5	3.0	27.6
manuf	10–25	844	20.9	5.7	26.6	3.5	30.1
manuf	25–100	494	20.3	5.8	26.2	3.6	29.7
manuf	>100	244	10.1	4.2	14.3	2.7	17.0
manuf	all	34,152	13.6	4.5	18.1	2.9	21.0
const	0–0.5	38,930	12.5	3.8	16.3	1.9	18.2
const	0.5–1	5,526	12.0	3.9	15.9	2.3	18.2
const	1–2	2,632	11.0	4.1	15.1	1.4	16.5
const	2–5	1,059	11.9	2.4	14.3	2.9	17.2
const	5–10	369	16.7	2.6	19.3	2.4	21.8
const	10–25	104	11.0	3.5	14.5	1.8	16.3
const	>25M	63	15.2	3.2	18.4	2.3	20.7
const	all	48,683	12.6	3.6	16.2	2.1	18.2
transp	0–0.5	15,791	9.9	1.7	11.6	2.6	14.2
transp	0.5–1	1,937	10.3	2.6	12.9	2.8	15.7
transp	1–2	835	16.1	2.2	18.3	4.4	22.6
transp	2–5	533	12.8	0.9	13.7	3.2	16.9
transp	5–10	173	12.4	3.1	15.6	3.2	18.8

Table B2 *continued*
Detailed Table of Various Aggregate All Canada Effective Tax Rates (in per cent) by Industry and Net Asset Size, 1987

Industry	Asset Size	Count	Federal	Ontario	Fed & Ont	Other Prov	Fed & Prov
transp	10–25	158	18.3	3.6	21.9	4.0	25.9
transp	25–100	90	21.2	2.9	24.1	5.8	29.8
transp	>100	75	7.9	2.6	10.5	3.8	14.3
transp	all	19,592	9.6	2.6	12.2	3.8	16.0
wholesale	0–0.5	25,128	13.3	3.4	16.8	2.5	19.3
wholesale	0.5–1	6,382	13.9	2.9	16.8	3.3	20.1
wholesale	1–2	3,927	16.3	3.3	19.6	3.1	22.7
wholesale	2–5	2,886	20.4	3.5	24.0	3.6	27.6
wholesale	5–10	859	25.6	4.7	30.3	3.2	33.5
wholesale	10–25	433	25.0	5.2	30.2	3.6	33.8
wholesale	25–100	194	25.7	4.9	30.7	4.2	34.9
wholesale	>100	61	12.9	3.3	16.2	2.5	18.7
wholesale	all	39,870	18.1	3.8	22.0	3.2	25.1
retail	0–0.5	52,306	11.9	2.8	14.7	2.3	17.0
retail	0.5–1	8,257	14.2	2.2	16.5	3.1	19.6
retail	1–2	3,412	14.1	2.9	17.0	2.6	19.6
retail	2–5	1,541	12.5	2.7	15.2	2.2	17.4
retail	5–10	528	14.3	2.3	16.5	2.5	19.0
retail	10–25	180	7.7	1.1	8.9	1.7	10.5
retail	25–100	89	9.9	2.2	12.1	1.5	13.6
retail	>100	29	7.8	1.3	9.1	1.5	10.6
retail	all	66,342	10.6	2.1	12.6	2.0	14.6
banks	0–0.5	2,147	15.4	3.1	18.6	3.3	21.9
banks	0.5–1	318	256.8	16.2	273.0	94.6	367.6
banks	1–2	531	31.1	3.6	34.7	11.2	45.9
banks	5–10	48	8.7	2.6	11.2	0.6	11.8
banks	10–100	54	6.4	2.2	8.7	0.5	9.2

other financial	0.5–1	16,937	17.7	2.7	20.4	2.8	23.1
other financial	1–2	8,521	15.1	2.7	17.9	2.3	20.2
other financial	2–5	4,908	15.0	4.3	19.2	1.6	20.8
other financial	5–10	1,392	16.0	0.5	16.5	4.0	20.4
other financial	10–25	999	12.8	1.4	14.2	2.9	17.1
other financial	25–100	510	8.5	1.4	9.9	1.2	11.1
other financial	>100	237	8.6	2.4	11.1	1.1	12.2
other financial	all	114,254	10.4	2.1	12.5	1.6	14.1
services	0–0.5	81,810	11.6	2.9	14.5	2.3	16.9
services	0.5–1	7,764	12.4	2.3	14.7	3.0	17.7
services	1–2	3,050	10.9	2.2	13.1	1.8	14.9
services	2–5	1,663	9.0	2.9	11.9	1.4	13.3
services	5–10	393	18.6	6.8	25.3	0.8	26.2
services	10–25	304	14.4	3.1	17.5	2.6	20.1
services	25–100	114	5.7	2.0	7.7	0.9	8.6
services	>100	26	6.0	1.6	7.6	1.2	8.9
services	all	95,124	10.7	2.8	13.4	1.9	15.3

Notes

The first draft of this paper was prepared for the Ontario Fair Tax Commission and completed in November 1992.

1 In this report, the word *firm* will be considered to be synonymous with *corporation*, even though the former often has a more general usage that includes a business comprising a number of legal corporate entities.

2 The ratio-estimation technique is described in more detail in *Corporation Financial Statistics* (Statistics Canada 1987a). Profits, equity, and taxable income complete the major financial items used in the estimation.

3 Active corporations are those with assets of $50,000 or more and sales of $10,000 or more (Statistics Canada 1987a).

4 Intercorporate holdings are assets on a corporation's balance sheet that are financial claims on another Canadian corporation, such as "net investment in affiliates." These amounts are excluded in order to avoid double-counting the assets of the corporate sector.

5 Rates effective 1 July 1987 (see *Canadian Master Tax Guide* 1991).

6 Not all corporations were taxed at the basic Ontario tax rate of 15.5 per cent. Corporations engaged in manufacturing and processing, mining, farming, logging, and fishing were taxed at 14.5 per cent in 1987. Small businesses were taxed at a rate of 10.0 per cent for the first $200,000 of active business income (*Canadian Master Tax Guide* 1991).

7 Exceptions include corporations in the oil and gas and mining and smelting industries, and certain corporations in the finance sector. This is discussed in more detail in Statistics Canada's *Corporation Financial Statistics* (Cat. no. 61-207).

8 There are conceptual differences between the System of National Accounts concept of "Profits Before Taxes" ($53.9 billion in 1987) and the Industrial Organization and Finance Division's "Profits Before Taxes" figure ($85.9 billion), as found in table A in appendix A. Of this $32 billion difference, Canadian intercorporate dividends account for about $20 billion, and the net difference between capital cost allowance and book depreciation accounts for another $9 billion. The remaining difference can be explained by a combination of the System of National Accounts adding back depletion and amortization costs and the removal of government business enterprises figures.

9 This methodology was changed for taxation year 1988 forward. The interested reader is referred to the IOFD for further information on the methodology used for post-1987 data.

10 Corporations that are classified as mining services are further stratified by sales.

11 For taxation year 1987, 51.5 per cent of all corporations reported having positive taxable income, while 73.6 per cent of positive benchmark income was received by corporations with positive taxable income.

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3 Payroll Taxes

BEV DAHLBY

By international standards, payroll taxes (or social-security contributions) are relatively low in Canada. Such taxes represented about 13 per cent of total tax revenue in Canada in 1988, which was about half the average for OECD countries. (See Perry 1990, table 2.) This difference in reliance on payroll taxes is most significant when comparisons are made with the United States. While payroll taxes are relatively low in Canada, the share of revenue from this source has been increasing relatively rapidly in recent decades.

A number of public-finance specialists have advocated increased reliance on payroll taxes and consumption taxes because they feel that the distortionary effects of these taxes are lower than those of the personal and corporate income tax. A good example of the increased professional interest in payroll taxes is a paper by Whalley and Fretz (1990, 133) in which the authors note that payroll taxation in Canada "has major revenue-raising potential [and is] worthy of closer scrutiny." They also note that the payroll tax "may well be one of the least-studied taxes, even in developed countries" (130).

The Employer Health Tax (EHT), a payroll tax levied on the total Ontario remuneration of an employer, was the Government of Ontario's fourth-largest source of revenue in 1990–91. Given the historical and international trends and the favourable attitude displayed by many public-finance economists, an important question is: Should a payroll tax such as the EHT become a more important source of revenue for the Government of Ontario? This policy question is explored in this paper.

It is particularly important for the Fair Tax Commission to evaluate the payroll tax option because of the public's perception that a payroll tax collected from employers is not borne by employees. This perception is at odds with most (but by no means all) professional opinion on the incidence of payroll taxes. The potential regressivity of payroll taxes and their effects on employment make many observers apprehensive about increased reliance on such taxes as a source of tax revenue.

Payroll taxes have a relatively large impact on small businesses because small firms tend to be more labour intensive than large firms. Because employment growth in recent years has been concentrated in the small-business sector, the impact of payroll taxes on small business deserves special attention.

Payroll taxes raise important issues in fiscal federalism. For example, the federal government has recently moved to limit the deductibility of provincial payroll taxes and has expressed its concern about increases in its "voluntary" payment of provincial payroll taxes. In addition, some observers suspect that payroll taxes are favoured by provinces with large federal payrolls because they are thus able to export some of the tax burden to taxpayers in other provinces.

These issues are the subject of this research paper. It should be noted that the paper does not cover the financing of the compensation of workers. The rationale for this omission is that these levies are more in the nature of premiums (or user charges) because some attempt is made to relate these levies to the expected cost of providing the coverage. A second reason for excluding the financing of the compensation of workers is that such a complex subject could not be covered adequately within the rigours of this paper.

Payroll Taxes in Ontario

OHIP Premiums

Health-insurance premiums were used to finance health care in Ontario from 1959 to 1990. Premium rates for families were double those for single individuals; otherwise, the premiums did not vary with the characteristics of OHIP subscribers, such as medical history. Approximately 65 per cent of premiums were paid by employers as fringe benefits for their employees. The premiums paid by corporations were deductible under the corporate income tax and were treated as a taxable benefit of the employee under the personal income tax. Since

OHIP premiums, like all lump-sum payments, were regressive taxes, measures were enacted to ameliorate their undesirable distributional effect. Recipients of social assistance or veterans' pensions, and persons aged sixty-five and over did not pay OHIP premiums. Premium assistance was provided to individuals and families with low incomes. For example, in 1988 a family of four with an income of less than $15,290 was eligible for a 100-per-cent premium reduction. Premium reductions of 75 per cent, 50 per cent, and 25 per cent were also provided at higher-income levels (see table 1). The take-up rate for the premium assistance was relatively low. It was estimated, in 1978, that only one-third of those eligible for assistance actually applied for it.[1]

In 1969, revenues from premiums and grants from the federal government financed almost all of Ontario's health-care costs. However, as table 2 indicates, increases in OHIP premium rates were relatively infrequent, and, in the absence of a rate adjustment, revenue increased only in line with the number of subscribers. Consequently, revenues from OHIP premiums did not increase at the same rate as personal income or health-care expenditures, and the proportion of health-care costs covered by OHIP premiums declined over time.

The desire for a more buoyant source of revenue, as well as the concerns regarding the regressivity of OHIP premiums, prompted a number of reviews of alternative financing options by the Ontario government in the 1970s and early 1980s. In 1985, the Peterson government decided to eliminate OHIP premiums, and in the 1989 Ontario budget it was announced that they would be replaced by the new Employer Health Tax (EHT).

The Employer Health Tax

The EHT is a payroll tax levied on the total Ontario remuneration of an employer and on the earnings of the self-employed. An employer's total Ontario remuneration includes all "salaries and wages, bonuses, taxable allowances and commissions [paid to employees] who report for work at a permanent establishment of the employer in Ontario."[2] As table 3 indicates, small employers with total annual remuneration of less than $200,000 are taxed at half the rate imposed on employers with total remuneration of $400,000, and there is a graduated increase in the tax rate between these two thresholds.

In the fiscal year 1990–91, a total of $2.662 billion was collected from the EHT. It was the Government of Ontario's fourth-largest source

TABLE 1
OHIP Premium Assistance Threshold Levels, 1988

Level of assistance	Single	Two	Three	Four[a]
100%	$9,650	$15,110	$15,200	$15,290
75%	$10,170	$16,160	$16,250	$16,340
50%	$10,690	$16,690	$16,780	$16,870
25%	$11,220	$17,200	$17,290	$17,380

Source: Ministry of Treasury and Economics, Government of Ontario
[a] $90 for each additional dependent

of tax revenue, at 6.1 per cent of total revenue. Only the personal income tax, the retail sales tax, and the corporate income tax contributed more tax revenue (see figure 1). In 1990, total employer remuneration, the base for the EHT, was $132.4 billion, or about 80 per cent of the total wages, salaries, and supplementary-labour income generated in the province. The base for the EHT is, therefore, larger than corporate profits, $19.8 billion, or retail sales, $73.3 billion, but less than total personal expenditure on consumer goods and services, $156.7 billion, or total assessed income of $176.9 billion (in 1989). It is estimated that the total cost of collecting the EHT, including all support functions provided by the Ministry of Revenue, is $0.45 per $100 of revenue collected.[3]

In 1992–93, the total EHT revenue is projected to increase to $2.745 billion. The increasing relative importance of the EHT in the revenue structure of the Government of Ontario, at least in the short term, is reflected in the fact that, between 1990–91 and 1992–93, the personal income tax, the retail sales tax, and the corporation tax are expected *to decline* by $1.56 billion, $0.311 billion, and $0.530 billion, respectively, while the EHT is projected *to increase* by $83 million.[4]

Table 4 presents statistics on the EHT by the size of the total remuneration of employers in 1990. Just over 60 per cent of all employers had less than $50,000 in total remuneration. This group of employers contributed only 1.16 per cent of total EHT revenues, which was roughly half their share of total remuneration because of the reduced tax rate that applies to small firms. Almost 85 per cent of employers were taxed at the minimum rate of 0.98 per cent. In addition, 6.8 per cent of employers had total remuneration between $200,000 and $400,000 and were taxed at the reduced rates shown in table 3. Just over 9 per cent of employers were taxed at the maximum rate of 1.95 per cent, and these employers contributed 91.36 per cent of total EHT revenues. In fact, the 4 per cent of employers

TABLE 2
OHIP Premiums and Revenues

Year	Monthly premium ($ single/family)	Revenue ($ billions)	Revenue as a percentage of OHIP expenditures (per cent)
1982–83	23&27/46&54	$1.4	76
1983–84	27&28.35/54&56.70	$1.5	70
1984–85	28.35&29.75/56.70&59.50	$1.6	67
1985–86	29.75/59.50	$1.6	59
1986–87	29.75/59.50	$1.7	53
1987–88	29.75/59.50	$1.7	47
1988–89	29.75/59.50	$1.7	44
1989–90	29.75/59.50	$1.4	33
1990–91	N/A	$2.7[a]	58
1991–92	N/A	$2.7[a]	50

Source: Ministry of Treasury and Economics, Government of Ontario
[a] Employer Health Tax Revenue

with total remuneration of more than $1 million accounted for 82.50 per cent of total EHT revenues.

Table 5 shows the distribution of EHT revenues by the number of employees per firm. Firms with fewer than five employees represented 70.8 per cent of firms and contributed less than 3.5 per cent of total EHT revenues in 1990. At the other extreme, firms with 500 or more employees, representing only 0.4 per cent of firms, employed 47.4 per cent of all workers and contributed 56.6 per cent of total EHT revenues.

Table 6 shows the distribution of EHT revenues in 1990 by industry. The largest source of EHT revenue was the manufacturing sector, which accounted for 21.1 per cent of employees and contributed 26.1 per cent of total EHT revenues. Note that retail trade accounted for 12.9 per cent of employees, but contributed only 6.8 per cent of total EHT revenues. This relatively low share of revenues is probably the result of the relatively large number of small businesses as well as the below-average wages paid in this sector.[5] Finally, it is interesting to note that 10 per cent of EHT revenues are collected from the public sector. It is estimated that, in 1990, $69 million was collected from the Ontario public sector, $38 million was collected from Ontario Hydro, and $123 million was collected from the federal civil service.[6]

In his 30 April 1992 budget, the Treasurer of Ontario announced

TABLE 3
Employer Health Tax Rates

Remuneration range	Tax rate
less than $200,000	0.00980
$200,001–$230,000	0.01101
$230,001–260,000	0.01223
$260,001–290,000	0.01344
$290,001–320,000	0.01465
$320,001–350,000	0.01586
$350,001–380,000	0.01708
$380,001–400,000	0.01829
more than $400,000	0.01950

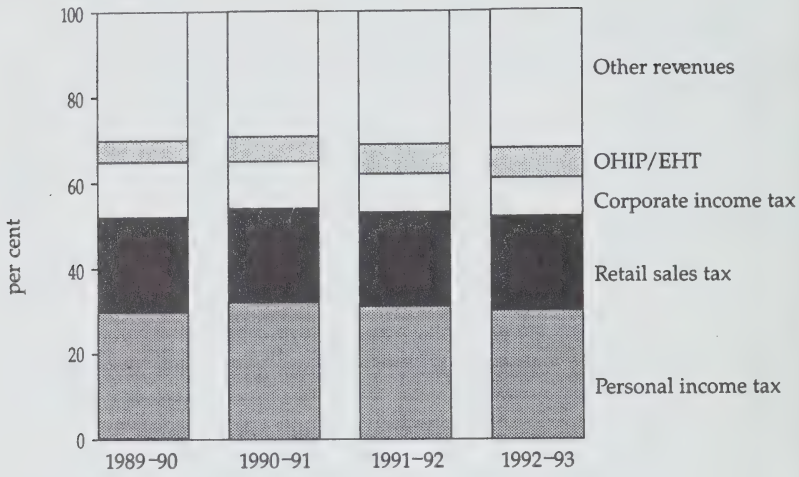
that the EHT would be levied on self-employed individuals beginning in November 1993. The tax base will be total net self-employed income as calculated for federal income tax purposes with the first $40,000 exempt from the tax. Table 7 shows how the EHT for self-employed individuals will be calculated. It is estimated that the EHT on self-employed individuals will yield approximately $45 million per year.[7]

The Federal Government's Payroll Taxes

The EHT is not the only payroll tax imposed in Ontario. The federal government also levies payroll taxes to finance Unemployment Insurance and the Canada Pension Plan (CPP).[8] In 1992, the CPP contribution rate was 2.4 per cent of pensionable earnings. It is collected from both the employer and the employee, and, consequently, the self-employed contribute 4.8 per cent of pensionable earnings. Contributions, which are deductible for income tax purposes, are based on earnings in excess of an exemption level. In 1992, maximum pensionable earnings are equal to the average industrial wage of $32,200, and the exempt earnings are $3000. Thus, the maximum contribution for an employee is $696, or $1392 by both the employer and the employee.

The employee contribution rate for unemployment insurance in 1992 is 3.0 per cent of insurable earnings. The employer contribution rate is 1.4 times the employee rate, or 4.2 per cent in 1992. The maximum insurable earnings in 1992 are $36,920, and therefore the

Figure 1
Composition of Revenue: Government of Ontario



Source: 1992 Ontario Budget, p. 91

maximum contribution is $1107.60 by an employee and $1550.64 by an employer. Contributions are deductible for income tax purposes.

Figure 2 shows the total payroll tax (EHT, CPP, and UI) levied in Ontario in 1992 as a percentage of an employee's annual employment income. (It is assumed that the EHT is levied at the maximum rate of 1.95 per cent.) The average total payroll tax rate increases slightly as earnings increase up to the maximum pensionable earnings for CPP because of the earnings exemption in the calculation of CPP contributions. The average payroll tax rate peaks at 13.5 per cent, and then declines as earnings increase beyond the maximum pensionable earnings of the CPP. As earnings increase, the average payroll tax rate asymptotically approaches the EHT rate because there is no upper limit on the EHT.

Figure 3 shows the marginal total payroll tax rates in Ontario in 1992 at different earning levels for an employee. This tax rate indicates the additional payroll tax that must be paid on an additional dollar paid to an employee. Below the maximum pensionable earnings under the CPP, the marginal tax rate is 8.55 per cent for the employer and 5.4 per cent for the employee, or a total marginal tax rate of 13.95 per cent. The marginal total payroll tax rate declines by 4.8 per cent

TABLE 4
The Distribution of EHT Revenues by Employers' Total Remuneration, 1990

Remuneration per employer	Percentage of employers	Percentage of total remuneration	Percentage of total EHT revenue
less than 50,000	60.33	2.18	1.16
50,001–100,000	13.52	2.61	1.39
100,001–150,000	6.45	2.14	1.14
150,001–200,000	3.89	1.83	0.98
200,001–250,000	2.57	1.56	0.97
250,001–300,000	1.79	1.33	0.97
300,001–350,000	1.35	1.19	0.99
350,001–400,000	1.06	1.07	1.03
400,001–450,000	0.83	0.95	1.01
450,001–500,000	0.70	0.90	0.95
500,001–550,000	0.58	0.83	0.88
550,001–600,000	0.50	0.79	0.83
600,001–650,000	0.41	0.70	0.74
650,001–700,000	0.37	0.68	0.72
700,001–750,000	0.34	0.66	0.70
750,001–800,000	0.30	0.62	0.66
800,001–850,000	0.26	0.59	0.63
850,001–900,000	0.23	0.55	0.59
900,001–950,000	0.22	0.55	0.58
950,001–1,000,000	0.20	0.54	0.57
more than 1,000,000	4.09	77.74	82.50
Total	100.00	100.00	100.00

Source: Ontario Ministry of Treasury and Economics, Government of Ontario

after the maximum pensionable earnings level is reached and by 7.2 per cent after the maximum insurable earnings level is reached. Beyond $36,920, the marginal payroll tax rate is the EHT rate.

Table 8 shows the payroll taxes levied in Ontario in 1991 at various levels of employment income. The EHT, which has been calculated at the maximum rate of 1.95 per cent, exceeded an employer's CPP contribution when an employee's income was less than $19,714, or when it exceeded $32,436, and it exceeded the UI contribution of an employer when the employee's income exceeded $64,103. Table 8 also compares total payroll taxes with the 1991 federal and provincial income tax, imposed on a married taxpayer with two dependent children under 16 years of age.[9] The table indicates that the employee's UI and CPP contributions exceeded the employee's personal income tax payments in the $20,000–$27,500 income range and that the total payroll taxes collected from the employer and employee exceeded the

TABLE 5
The Distribution of EHT Revenues by Number of Employees per Firm, 1990[a]

Employees per firm	Percentage of firms	Percentage of employees	Total EHT revenue ($ million)	Percentage of total EHT revenues
Fewer than 5	70.8	7.1	92	3.5
5–19.9	19.4	11.5	148	5.6
20–49.9	5.4	9.7	249	9.3
50–99.9	2.0	7.7	208	7.8
100–499.9	1.7	16.3	459	17.3
500 or more	0.4	47.4	1505	56.6
Total	100.0	100.0	2662	100.0

Source: Ontario Ministry of Treasury and Economics based on data from the Small Business and Special Surveys Division, Statistics Canada

[a] The current EHT form does not require tax filers to indicate the number of employees (full- or part-time) their total Ontario remuneration is based on. In order to represent EHT liability by size of employer, the Small Business Survey was employed. Remuneration by size of firm was used to "extrapolate" the EHT liability over firms by number of employees.

personal income tax payments for a taxpayer with less than $30,000 in income. Thus, the payroll taxes represent a very significant component of the tax burden imposed on the wages of workers who earn less than the average industrial wage. If the payroll taxes collected from employers are ultimately borne by workers, then the payroll taxes nullify the redistributive effects of the personal income tax over the $15,000–$20,000 income range and substantially reduce the progressivity of the tax system. The regressive effects of the payroll taxes are attributable to the federal government's payroll tax and are not caused by the EHT because it does not have a limit on the maximum tax payment.

Payroll Taxes in Other Provinces

Payroll taxes are also levied by Quebec, Manitoba, and Newfoundland. Table 9 shows the revenues collected from employer contributions to the Health Service Fund (Fonds des services de santé) in Quebec. In 1990–91, it contributed 11.15 per cent of total taxes and 7.85 per cent of revenue for the Government of Quebec. When this payroll tax was introduced in 1973, it was levied on employers, employees, and the self-employed. Since 1978, employees and the self-

TABLE 6
The Distribution of EHT Revenues by Industry, 1990[a]

Industry	Percentage of firms	Percentage of employees	Total EHT revenue ($ million)	Percentage of total EHT revenues
Primary	4.7	0.7	14	0.5
Mines, Quarries, & Oil Wells	0.3	0.9	40	1.5
Manufacturing	0.3	21.1	696	26.1
Construction	12.9	5.5	166	6.2
Transportation	3.5	6.6	217	8.2
Wholesale Trade	6.5	6.1	164	6.2
Retail Trade	15.0	12.9	182	6.8
Finance, Insurance, & Real Estate	7.2	7.4	234	8.8
Community Services	8.8	13.4	372	14.0
Business and Personal Services	27.6	17.5	292	11.0
Public Administration	0.4	7.2	265	10.0
Unclassified	5.7	1.0	21	0.8
Total	100.0	100.0	2662	100.0

Source: Ontario Ministry of Treasury and Economics, based on data from the Small Business and Special Surveys Division, Statistics Canada

[a] The current EHT form does not require tax filers to indicate their industry classification. As a result, the figures depicted in this table were derived from a Small Business data survey. The EHT liability was apportioned according to industry remuneration allocations and then prorated by industry weights (industry classification relative to overall totals).

employed are no longer taxed.[10] In 1981, the tax rate was increased from 1.5 per cent to 3.0 per cent. Tax-rate increases occurred in 1986, 1989, and 1990. Since September 1991, the tax rate has been 3.75 per cent.[11] There is no provision for lower taxation of small business.

Table 10 shows the revenues collected from the Health and Post Secondary Education Tax Levy in Manitoba. This tax, which was introduced midway through the 1982–83 fiscal year, was initially set at 1.5 per cent of payrolls by all employers with permanent establishments in Manitoba. In 1984, employers with payrolls of less than $50,000 were exempted from the tax, and a "notch rate" of 4.5 per cent was levied on the difference between the employer's payroll and $50,000 for payrolls between $50,000 and $75,000. In 1987, the tax rate was increased to 2.25 per cent, the exemption level was increased to $100,000, and a notch rate of 6.75 per cent was applied to payrolls

TABLE 7
Calculation of EHT for a Self-Employed Individual

Total net self-employment income	Calculation of tax[a]
0–$200,000	0.0098 x (N – $40,000)
$200,001–$400,000	$1,568 + 0.02726 x ($N$ – $200,000)
Over $400,000	0.0195 x (N – $40,000)

Source: 1992 Ontario Budget, p. 34
[a] N = total net self-employment income

between $100,000 and $150,000. In 1989, the exemption level was increased to $300,000, and a notch rate of 4.5 per cent was applied to payrolls between $300,000 and $600,000. Since 1 January 1990, the tax rate has been 2.25 per cent, with an exemption level of $600,000. A notch rate of 4.5 per cent is applied to payrolls between $600,000 and $1,200,000. In 1990–91, the payroll tax contributed 7.28 per cent of total taxes and 3.93 per cent of revenue for the Government of Manitoba.

The Manitoba payroll tax is interesting because the payroll tax relief for small business is provided through an exemption, in contrast to Ontario, where a lower rate is applied, and to Quebec, where no tax-rate relief is provided to small business. The application of the notch tax rate lowers the average payroll tax rate for firms in the range where this rate applies, but it increases their marginal payroll tax rate. Thus, the average payroll tax rate increases from 0 to 2.25 per cent as payrolls increase from $600,000 and $1,200,000, but all firms in this range face a marginal payroll tax rate of 4.5 per cent. A firm with a payroll in excess of $1,200,000 faces an average and marginal payroll tax rate of 2.25 per cent.

In 1990, Newfoundland introduced a payroll tax of 1.5 per cent on payrolls in excess of $300,000 with an exemption for primary producers and secondary processors in fisheries, forestry, and agriculture (Canadian Tax Foundation 1992b, 10: 26). The tax was extended to local government in 1991, and the rate was increased to 2.0 per cent.

Health insurance premiums are imposed in Alberta and British Columbia. In 1992, the rate in Alberta was $324 per year for a single individual and $648 per year for a family. In British Columbia, the rate was $420 per year for a single individual and $840 per year for a family.

Table 11 provides an indication of the growing importance of payroll taxes and health-care premiums for Canadian governments. In

Figure 2
Average Payroll Tax Rates in Ontario, 1992

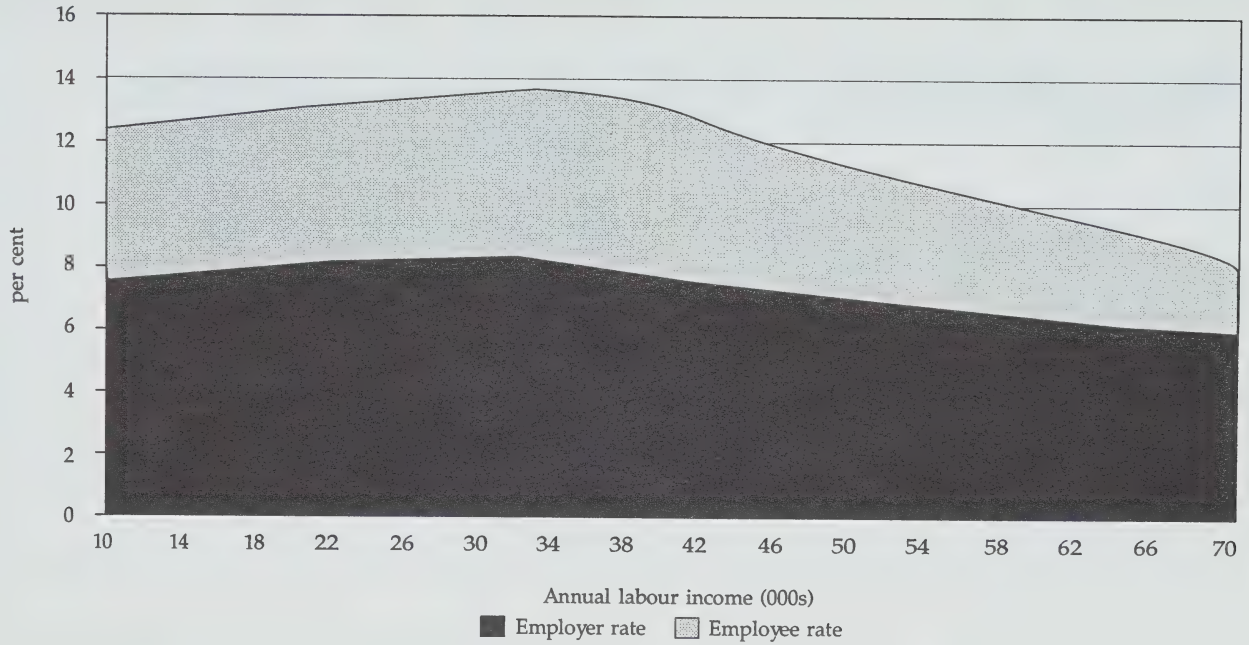


Figure 3
Marginal Payroll Tax Rates in Ontario, 1992

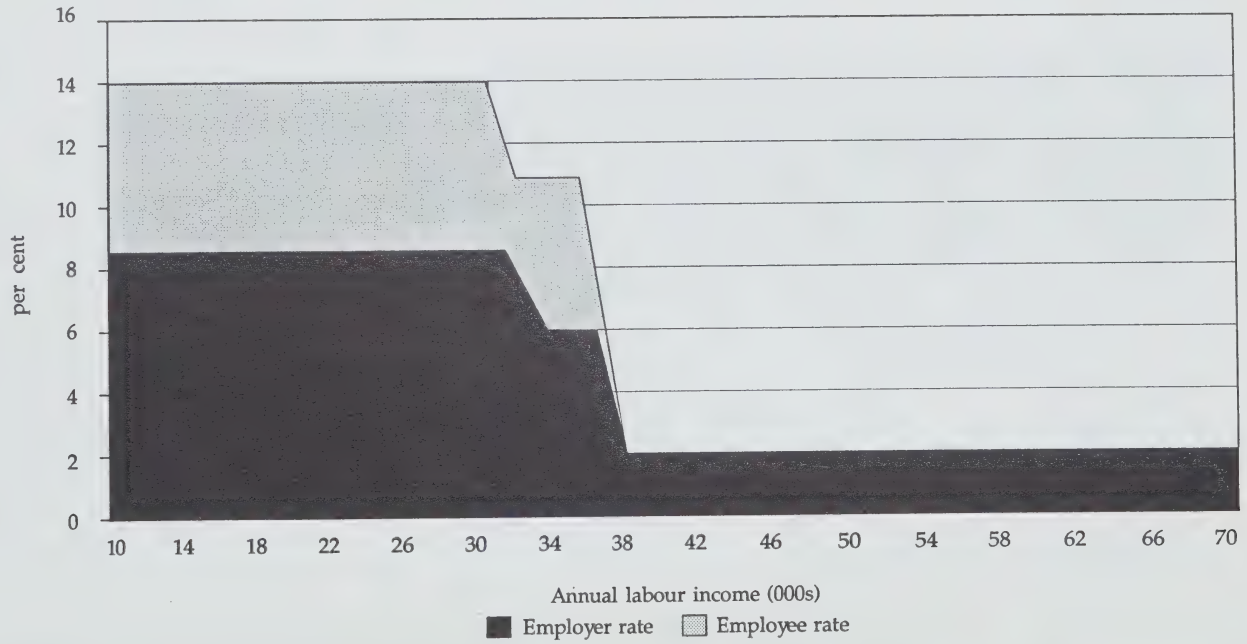


TABLE 8
Payroll Taxes and Personal Income Taxes in Ontario, 1991

Annual employment income	Employer				Employee				Total payroll tax	Total direct taxes
	EHT	CPP	UI	Total	CPP	UI	Total	PIT		
5,000	97.50	46.00	176.80	320.30	46.00	126.30	172.30	−1,750	492.60	−1,257
7,500	146.30	103.50	265.10	514.90	103.50	189.40	292.90	−1,750	807.80	−942
10,000	195.00	161.00	353.50	709.50	161.00	252.50	413.50	−1,750	1,123.00	−627
12,500	243.80	218.50	441.90	904.20	218.50	315.60	534.10	−1,670	1,438.30	−232
15,000	292.50	276.00	530.30	1,098.80	276.00	378.80	654.80	−1,245	1,753.60	509
17,500	341.30	333.50	618.60	1,293.40	333.50	441.90	775.40	−820	2,068.80	1,249
20,000	390.00	391.00	707.00	1,488.00	391.00	505.00	896.00	−395	2,384.00	1,989
22,500	438.80	448.50	795.40	1,682.70	448.50	568.10	1,016.60	123	2,699.30	2,822
27,500	536.30	563.50	972.10	2,071.90	563.50	694.40	1,257.90	2,536	3,329.80	5,866
30,000	585.00	621.00	1,061.00	2,267.00	621.00	757.50	1,378.50	3,714	3,645.50	7,360
35,000	682.50	632.50	1,237.00	2,552.00	632.50	883.80	1,516.30	6,231	4,068.30	10,299
40,000	780.00	632.50	1,250.00	2,662.50	632.50	892.80	1,525.30	8,562	4,187.80	12,750
50,000	975.00	632.50	1,250.00	2,857.50	632.50	892.80	1,525.30	13,060	4,382.80	17,443
75,000	1,463.00	632.50	1,250.00	3,345.50	632.50	892.80	1,525.30	24,770	4,870.80	29,641
100,000	1,950.00	632.50	1,250.00	3,832.50	632.50	892.80	1,525.30	36,800	5,357.80	42,158
200,000	3,900.00	632.50	1,250.00	5,782.50	632.50	892.80	1,525.30	85,920	7,307.80	93,228

TABLE 9
Payroll Tax Revenue of the Government of Quebec

Year	Employer contribution to Health Services Fund ($ millions)	As a percentage of total taxes	Total revenue
1978–79	482.91	6.43	4.05
1979–80	521.14	6.20	3.92
1980–81	601.88	6.33	4.09
1981–82	1,275.03	11.07	7.30
1982–83	1,337.14	10.84	6.96
1983–84	1,440.80	10.84	6.73
1984–85	1,509.50	10.73	6.77
1985–86	1,600.80	10.05	6.59
1986–87	1,828.95	10.56	7.13
1987–88	2,049.19	10.58	7.22
1988–89	2,159.51	10.56	7.21
1989–90	2,468.89	11.65	7.93
1990–91	2,636.00	11.15	7.85

Source: Quebec *Public Accounts* and Budget Speeches

1950, unemployment insurance contributions and hospital and medical insurance premiums represented 3.1 per cent of total government revenue. In 1970, after the introduction of the CPP and QPP, the payroll taxes used to finance unemployment, health, and pension programs represented 7.5 per cent of revenues. By 1988, their revenue share had increased to 9.2 per cent. If contributions for the compensation of workers are added to the payroll taxes (and this sum is denoted as social-insurance contributions), the revenue share increased from 4.3 per cent in 1950 to 11.0 per cent in 1988. As a percentage of total wages and salaries, the social-insurance contributions have increased from 2.1 per cent in 1950 to 8.1 per cent in 1988.

International Comparisons

While payroll taxes have become increasingly important as a source of revenue for Canadian governments, they are still relatively low by international standards. Figures cited by Perry (1990, table 2) indicate the percentage of tax revenue from social-security contributions in Canada is about half the average for all OECD countries.[12] Figure 4 shows that Canada had the lowest share of tax revenue from social-security contributions among the Group of Seven (G7) leading industrial countries in 1989. The share of tax revenues of social-security

TABLE 10
Payroll Tax Revenue of the Government of Manitoba

Year	Revenue from the Health and Post Secondary Education Tax Levy ($ millions)	As a percentage of total taxes	Total revenues
1982–83	55.52	4.44	2.30
1983–84	108.14	7.18	3.87
1984–85	111.70	7.20	3.82
1985–86	118.29	6.92	3.80
1986–87	126.59	6.64	3.74
1987–88	187.57	7.84	4.64
1988–89	199.19	7.54	4.59
1989–90	191.27	7.33	4.15
1990–91	186.49	7.28	3.93

Source: Data provided by Clayton Manness, Minister of Finance, *Public Accounts*

contributions in Canada was roughly a third of its share in France, where it accounted for over 40 per cent of tax revenue. Whether Canada will follow the pattern of taxation observed in other countries and place increasing reliance on payroll taxes to finance government spending is one of the most important tax policy issues that will have to be addressed in the coming decades, especially if health-care costs and pensions increase with population ageing.[13]

Perhaps the most significant international comparison is between Canada and the United States, where social-security contributions now account for over 25 per cent of tax revenues and social-security taxes are "the single largest tax burden on more than three-fourths of Americans."[14] Cléroux (1990, figure 7) has compared the tax burden on a typical small business in Ontario in 1990 with its tax burden in the five states that absorb 70 per cent of Ontario's exports to the United States. He found that, while the total tax burden was highest in Ontario, the payroll tax burden was 26 per cent higher in Michigan, 30 per cent higher in New Jersey, 35 per cent higher in New York, 39 per cent higher in Pennsylvania, and 65 per cent higher in Ohio.

Since the public's perception of the incidence of the payroll tax seems to be affected by whether the taxes are collected from employers or employees, a comparison of the share of social-security contributions of employers is of some interest. Figure 5 indicates that, compared with other G7 countries, Canada collects a relatively large share of its payroll taxes from employers and that the share of em-

TABLE 11
Payroll Taxes and Social-Insurance Contributions as a Percentage of Total Government Revenue and Total Wages and Salaries in Canada, 1950–1988

Year	Percentage of total government revenue		Social-insurance contributions as a percentage of total wages and salaries
	Payroll taxes[a]	Social-insurance contributions[b]	
1950	3.1	4.3	2.1
1960	3.8	4.9	2.5
1970	7.5	8.4	5.3
1980	7.1	8.5	5.6
1988	9.2	11.0	8.1

Source: Statistics Canada, *National Income and Expenditure Account*, Annual Estimates, 1926–86 (Ministry of Supply and Services, June 1988), Cat. No. 13-531, tables 1, 43, 49, and 52

Statistics Canada, *National Income and Expenditure Account*, Annual Estimates, 1977–88 (Minister of Supply and Services, December 1989), Cat. No. 13-201, tables 1, 44, 50, and 53

Notes: The figures for 1950–70 are taken from Cat. No. 13-531 and the figures for 1980 and 1988 are taken from Cat. No. 13-201.

[a] Payroll taxes are unemployment insurance contributions, hospital and medical insurance premiums, and Canada and Quebec pension plan contributions.

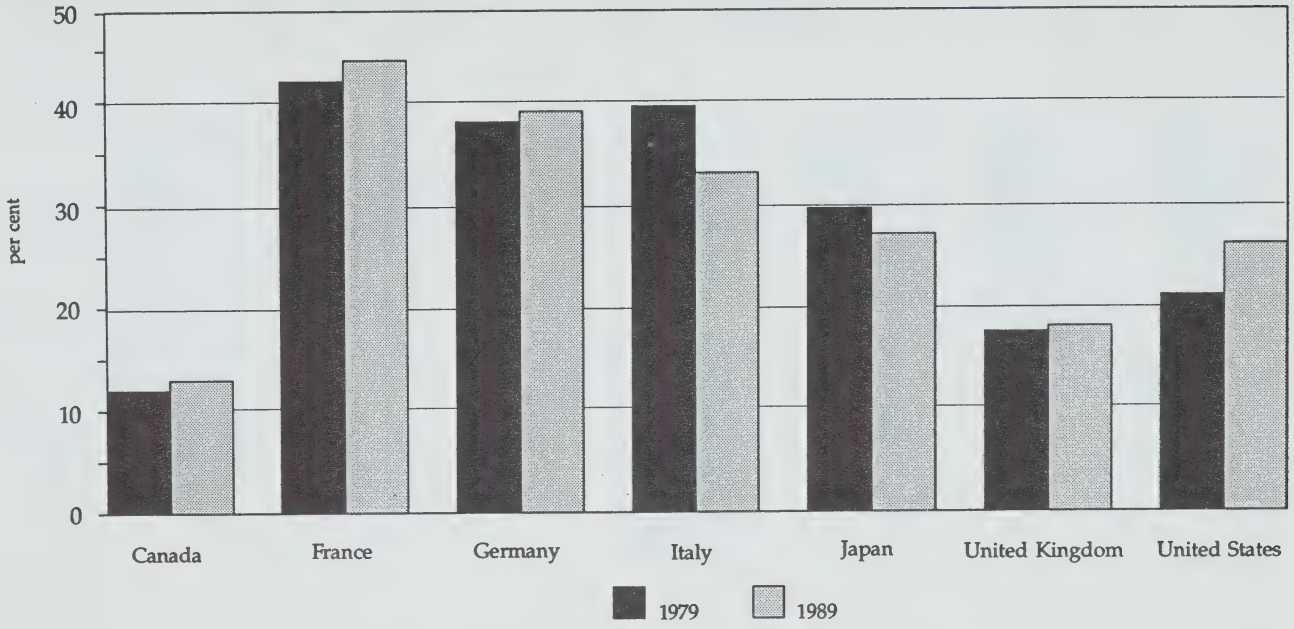
[b] Social-insurance contributions are payroll taxes plus workers' compensation contributions. Social-insurance contributions do not include the sales, corporate income, and personal income taxes earmarked for the Old Age Security Financing. The earmarking for social security was only notional; there was no separate fund.

ployers has been increasing. Among the G7 countries, only in Italy is the share of employers higher than it is in Canada. Among other OECD counties, the allocation of the payroll tax between employers and employees is very diverse. In Sweden, 95 per cent of social-security contributions are collected from employers, whereas, in Switzerland, only 33 per cent are collected from employers.[15]

The Incidence of Payroll Taxes: Theory

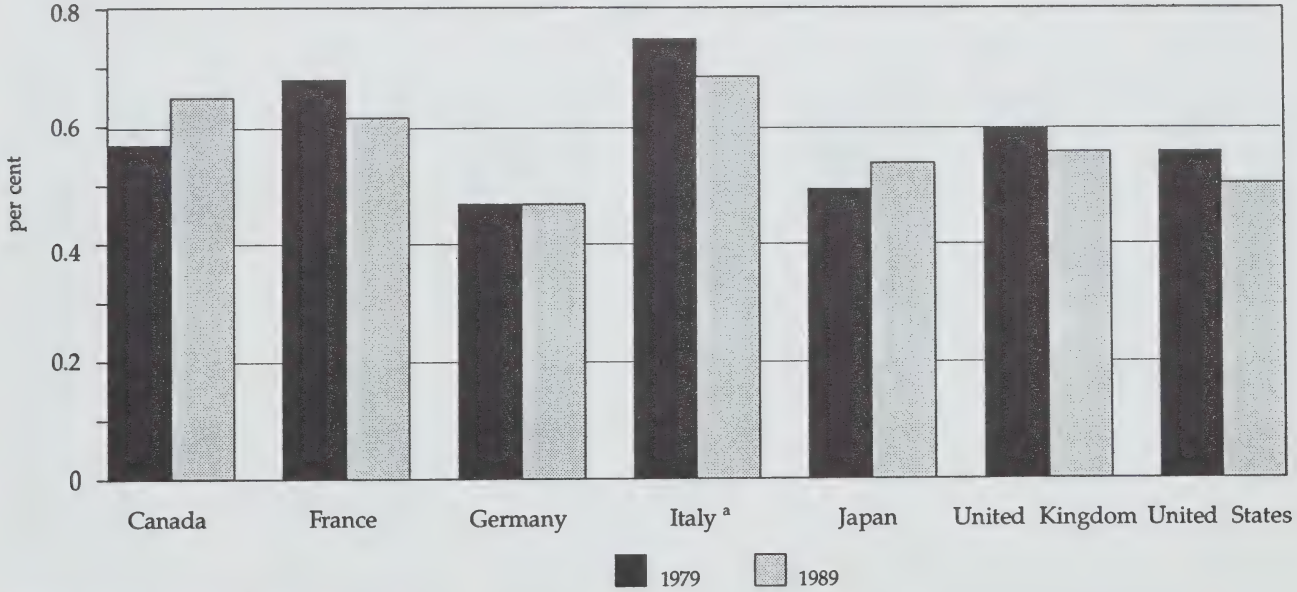
A tax imposes a burden on a household by altering the prices of the commodities that the household purchases and/or by altering the net returns on the household's land, labour, and capital. The burden of a tax levied on a firm is said to be shifted forward if the tax causes the price of the firm's product to rise. For example, an excise tax on

Figure 4
Social-Security Contributions as a Percentage of Combined Total Taxes and Social-Security Contributions



Source: Central Statistical Office 1992, Table 4

Figure 5
Employers' Shares of Social-Security Contributions in the G7 Countries



Source: Central Statistical Office 1992, table 4

[a]The figures for Italy are for 1979 and 1988.

cigarettes is borne by the consumers of cigarettes if the tax causes the price of cigarettes to increase. Firms that manufacture and sell cigarettes may not bear this tax, even though they pay the taxes to the government.[16] A tax levied on a firm is said to be shifted backward if it leads to a reduction in the price of an input purchased by the firm. For example, the burden of the payroll tax levied on employers is borne by workers if the tax causes a reduction in the wage rates of workers.

The extent to which the burden of a tax is shifted forward or backward is a complicated matter that depends on:

- *the responsiveness of the demand and supply for the taxed good to changes in its price.* In a competitive market, the elasticities of demand and supply of labour – which measure the percentage change in the demand or supply of labour when the real wage rate increases by one percentage point – determine the extent to which a payroll tax is borne by labour.
- *the time-frame.* The incidence of a tax in the short term may be very different from the incidence in the long term because the demand and the supply responses to price changes may be modest in the short term and immense in the long term. Thus, the extent to which a tax burden is shifted may change over time.
- *the degree of competition in a market.* If prices are determined by a firm with monopoly power, or if wages are negotiated by a strong labour union, then the extent of tax shifting may be significantly different from what would have occurred under competitive conditions.
- *whether the tax base is broad or narrow.* If the effective tax rate varies across industries, the inputs that are used more intensively by the highly taxed industries will tend to bear the burden of the tax.
- *how the government's budget constraint is altered when the tax is imposed.* The incidence of a tax will be affected by the extent to which the additional tax revenue is used (a) to reduce other taxes in a revenue-neutral manner, (b) to finance an increase in government spending, or (c) to reduce the government's deficit.

All of these factors must be taken into account when assessing the incidence of a tax.

There are basically two ways of assessing the extent to which an employer payroll tax is shifted to workers. One approach is to develop a theoretical model that can be used to predict the degree to which

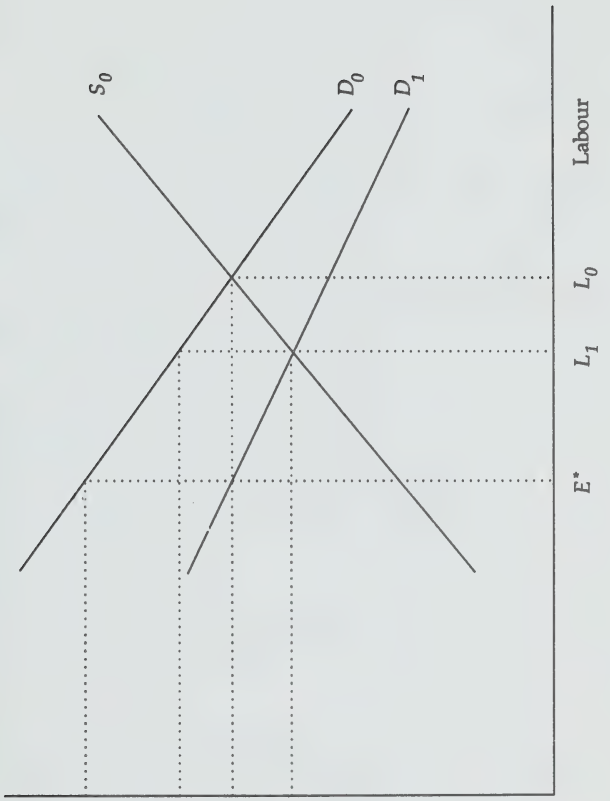
the tax is shifted, using estimates of the elasticities of demand and supply of labour. The second approach is to analyse data on wage rates and payroll taxes and try to infer the extent of tax shifting by using econometric methods to isolate the effect of taxes on market prices. The first approach is examined in this section, and the results from the second approach are surveyed in the next section.

The Competitive Labour Market Model of the Payroll Tax Incidence

I will begin with the static demand and supply model of a labour market.[17] This model is based upon the assumption that the labour market is competitive. Wage rates are assumed to adjust in response to market conditions to equate the available supply of labour with the amount of labour demanded by firms. No firm or union has the ability to influence the wage rate.

Figure 6 illustrates the incidence of an employer payroll tax in a competitive labour market. The real wage rate, W, is paid to labour, L. In the initial situation, before the payroll tax is imposed, the demand curve for labour by all employers is D_0, and the supply curve of labour by all households is S_0. It is assumed that the demand curve has a negative slope, indicating that employers will hire less labour when the real wage rate increases, and that the supply curve of labour has a positive slope, indicating that the amount of labour provided by households is higher when the real wage rate increases.[18] Prior to the introduction of the payroll tax, the wage rate is W_0, and the amount of labour employed is L_0. The curve labelled D_1 shows the amount of labour demanded when a payroll tax is levied at the rate t on all employers. The gap between the curves D_0 and D_1 is equal to the payroll tax per unit of labour, tW. If the wage rate remains at W_0, employers would reduce the quantity of labour demanded to E^*, and there would be an excess supply of labour equal to $L_0 - E^*$. In a competitive labour market, this surplus of labour would cause the wage rate to decline until the surplus was eliminated. This would occur when the demand for labour equals the supply of labour at the wage rate W_1 with L_1 units of labour employed. Thus, in the situation depicted in figure 6, part of the burden of the payroll tax of employers would be borne by labour through a reduction in the wage rate from W_0 to W_1. The remainder of the payroll tax burden is borne by the recipients of capital income because the cost of a unit of labour has risen by W_0 to $(1 + t)W_1$, thereby reducing the return that is earned by capital.

Figure 6



If the payroll tax rate is relatively small, labour's share and capital's share of the payroll tax burden would be equal to the following:

$$\text{Labour's share of the payroll tax burden} = \frac{-\varepsilon}{\eta - \varepsilon} \quad (1)$$

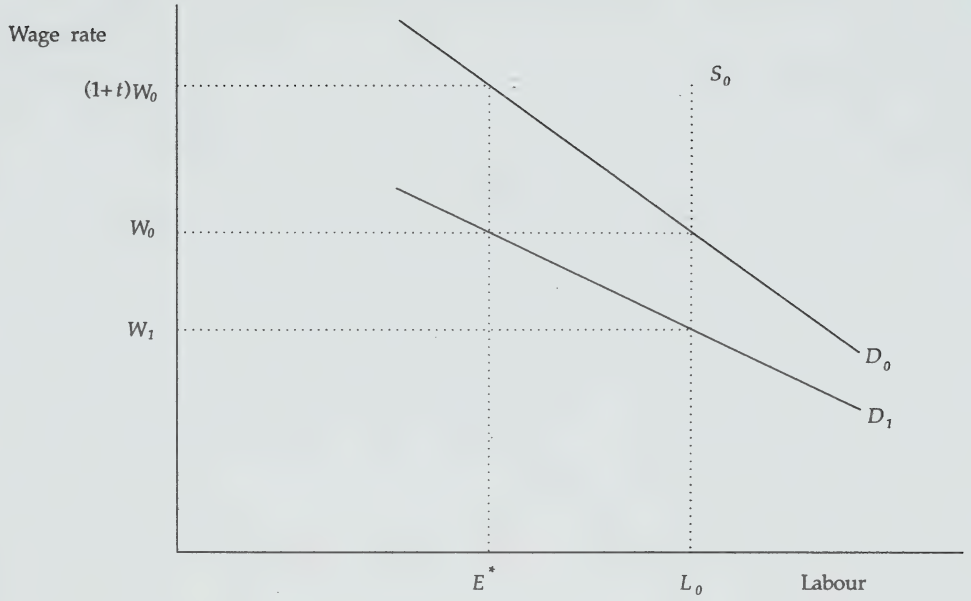
$$\text{Capital's share of the payroll tax burden} = \frac{-\eta}{\eta - \varepsilon} \quad (2)$$

where ε is the elasticity of the demand for labour (defined as a negative number) and η is the elasticity of the supply of labour. Labour's share of the payroll tax burden will be greater (a) the lower the elasticity of supply of labour and (b) the greater the absolute value of the elasticity of the demand for labour.

In the special case where the supply of labour is completely unresponsive to the changes in the real after-tax wage rate, η is zero, and labour would bear the entire payroll tax burden. Figure 7 shows the incidence of the payroll tax in this situation. The labour supply curve is, in this case, a vertical line, and the labour market equilibrium is restored when labour demand equals L_0 or, in other words, when the wage rate declines by the full amount of the tax and is equal to W_1. If the labour supply curve has a negative slope, such that less labour is supplied when the real wage rate rises because workers want to "consume" some of their increased earnings by enjoying more leisure, then workers would bear more than the full burden of the employer payroll tax because the wage rate would decrease by more than the full amount of the tax.

The analysis to this point has ignored the use that is made of the tax revenues. As noted above, the additional tax revenues could be used to reduce other taxes, to reduce the deficit, or increase expenditures. The use of the tax revenues will affect the incidence of the payroll tax in so far as it alters the demand or the supply of labour. In view of the tax substitution that took place when the EHT was introduced, we will examine the effect of removing a lump-sum tax. If it is assumed that the OHIP premiums were actually borne by employees, then the removal of the premiums would have shifted the labour supply curve to the left because it is usually assumed workers will respond to an increase in non-labour disposable income by reducing hours of work. In terms of figure 6, the removal of the OHIP premiums would have shifted the labour supply curve S_0 to the left, thereby moderating the reduction in the wage rate and lowering the share of the burden of the payroll tax that would be borne by labour.

Figure 7



Three features of the competitive labour market model should be noted. First, the competitive market model predicts that the distribution of payroll-tax burden between labour and capital will not depend on whether the tax is collected from employers or from employees. Consequently, the widely held view that employers bear the EHT because it is collected from employers is inconsistent with the predictions of the competitive labour market model. Second, the model does not indicate the mechanism by which the burden of the payroll tax of employers is shifted to labour. Thus, the decline in the real wage rate from W_0 to W_1 in figure 6 may be the result of either a decline in the nominal wage rate that is paid to labour or an increase in the price level resulting from output price increases caused by firms responding to higher production costs. Either mechanism – the wage cut or the price-level increase – has the effect of reducing the real wages of workers and shifting the payroll tax burden to labour.[19] Third, the competitive labour market model assumes that the wage rate adjusts to clear the labour market, and, therefore, the payroll tax does not cause an increase in the unemployment rate.

To conclude, the competitive labour market model predicts that the burden of a payroll tax will be distributed between labour and capital according to the relative responsiveness of the supply of labour and the demand for labour. Since the magnitudes of the elasticities of the demand and supply of labour play a crucial role in determining the distribution of the burden of the tax, the empirical evidence concerning these parameters are reviewed below.

The Aggregate Elasticity of Labour Supply

The supply of labour in Ontario is influenced by (a) the number of hours supplied by those who are currently employed, (b) the fraction of the working-age population who would like to be employed, i.e., the labour force participation rate, and (c) the total working-age population determined by interprovincial and international migration as well as natural population increase. Most of the empirical work by economists has focused on the labour-supply response of existing workers. Indeed, there is probably no aspect of household economic behaviour that has received more attention. Consequently, most of this survey will focus on this aspect of labour supply.

Numerous econometric studies have attempted to measure the responsiveness of hours of work by currently employed individuals to

changes in the wage rate. These studies have been surveyed by Hausman (1985), Pencavel (1986), and Killingsworth and Heckman (1986). In spite of the immense research effort, a considerable amount of uncertainty and controversy still attend labour supply elasticities. On the basis of studies in the United Kingdom and the United States, Pencavel has concluded that the elasticity of labour supply by males is about −0.10. This indicates that the income effect of a wage increase on the demand for leisure dominates the substitution effect that induces households to substitute goods for leisure. Pencavel has also concluded that the magnitude of the income effect is such that earnings will decline by 20 cents when an individual receives an additional dollar of non-labour income. Hausman, who focused on econometric studies that incorporate the effects of taxes on labour-supply decisions, has concluded that the male labour supply elasticity is in the range −0.13 to 0.08. With regard to the elasticity of labour supply by females, most studies have concluded that it is more elastic than that of males, although Killingsworth and Heckman (1986, 179) feel that recent research suggests that there is little difference between male and female labour supply elasticities. All in all, the econometric studies of labour supply suggest that the labour supply of individuals is quite unresponsive to changes in their net wage rate and that many individuals may have negatively sloped labour supply curves.

The Summer 1990 issue of *The Journal of Human Resources* contained the results of "state of the art" research on the impact of taxation on labour supply in five countries. I will briefly review these studies, which were completed after the surveys by Hausman, Pencavel, and Killingsworth and Heckman were published. A study of labour supply in Sweden by Blomquist and Hansson-Brusewitz (1990) found male labour supply elasticities in the range 0.08 to 0.13 and that female labour supply elasticities were higher and in the range 0.20 to 0.80. Colombino and del Boca (1990) found that the female labour supply elasticity in Italy was around 0.54 for hours and 0.64 for participation, but that the number of hours supplied by males was not responsive to variations in net wage rates. They attribute the lack of measured labour-supply response by males to institutional rigidities in the length of the work week and weeks worked per year. In their sample, 61.06 per cent of Italian males worked between 1,792 and 1,976 hours in 1979 in Turin. The study of labour supply in France by Bourguignon and Magnac (1990) also found relatively little variation in hours of work per week resulting from institutional fac-

tors. They felt that variations in labour supply in France occur through variations in the number of weeks worked per year, but these data were not available. A study by van Soest, Woittiez, and Kapteyn (1990) for the Netherlands found labour supply elasticities similar to those obtained by Blomquist and Hansson-Brusewitz for Sweden, but also noted that restrictions on hours of work have a significant impact on measured labour supply elasticities. The studies for the United States by Triest (1990a) and MaCurdy, Green, and Paarsch (1990) found wage rate elasticities in the range noted by Hausman, but have concluded that the income effects are smaller than previous studies have indicated. This has the implication that the compensated labour-supply response, which shows only the substitution effect of wage-rate changes, is smaller than previously estimated. Since the measurement of the deadweight loss from the tax system hinges on these compensated labour supply elasticities, the inefficiencies caused by taxation are smaller than those obtained by Hausman (1985). MaCurdy, Green, and Paarsch (1990, 462) concluded that "the results of this study ... raise serious questions about the reliability of evidence cited by much of the literature to support recent tax reform proposals aimed at lowering marginal tax rates." Triest (1990a, 510) has concluded that the combined effect of state and federal taxes in 1983 was to reduce the labour supplied by married males by 2.6 per cent, an effect that he characterized as fairly small but not trivial.

The effects on aggregate labour supply of changes in the labour force participation rates and net interprovincial migration might be quantitatively as important as the response of hours worked by currently employed individuals to changes in their net wage rate. The empirical literature on the determinants of migration in Canada has been surveyed for the Ontario Fair Tax Commission by Day and Winer (forthcoming), and, therefore, I will only repeat their conclusion that, while there is evidence from a variety of studies that the generosity of unemployment insurance benefits has a significant impact on interprovincial migration, there is little direct evidence that differences in taxation among provinces matter.

To conclude, given the empirical evidence on individual labour supply elasticities and the fact that elasticities of the labour force participation rate and the interprovincial migration rate with respect to the net wage rate in Ontario are probably positive, a reasonable range of values for the aggregate labour supply elasticity for the province is from -0.10 to 0.10, and this is the range of values used in computing labour's share of the burden of the EHT.

The Aggregate Elasticity of Demand for Labour

In trying to establish a reasonable range of values for the aggregate elasticity of demand for labour, it is important to specify what is held constant and what is assumed to vary when the wage rate increases. One way of defining the aggregate elasticity of the demand for labour is to assume that aggregate output and the return to capital remain constant when the wage rate increases. Hamermesh (1986, 453) has concluded that "in developed economies in the late twentieth century, the [absolute value of the] aggregate long-run, constant-output, labor-demand elasticity lies roughly in the range 0.15–0.50." The appropriateness of assuming that aggregate output remains constant when a payroll tax is imposed has been questioned by Feldstein (1972). He has argued that the appropriate definition of the elasticity of demand in assessing the incidence of a payroll tax is one in which output is allowed to vary. Feldstein's view on this matter is probably correct if the payroll tax revenue is returned to workers in the form of a lump-sum transfer because, as previously noted, this would cause a reduction in the supply of labour as workers choose to consume fewer goods and more leisure. If it is assumed that the supply of capital is fixed, then the variable-output elasticity of demand for labour is *nine* times as large as the constant-output elasticity of demand for labour if wages represent about two-thirds of national income. Thus, based on Hamermesh's range of values for the constant-output elasticity of labour demand, the constant-capital-stock elasticity of labour demand would be in the range −1.35 to −4.50. If the economy's capital stock depends on the after-tax rate of return on capital, then the variable-output demand for labour will be even more elastic. In the extreme case of a small open economy where the net real rate of return on capital is determined on the world market, the variable-output demand for labour will be completely elastic, and labour will bear the full burden of a tax on the payrolls of employers. These a priori arguments that the elasticity of labour in Ontario is highly elastic are supported by a recent econometric study of the Canadian labour market by Keil and Symons (1990) who found that the long-run variable-output elasticity of demand for labour was about −2.

To conclude, given that the variable-output definition of the aggregate demand for labour is the appropriate one, a reasonable range of values for the elasticity of labour demand is −1.35 to −4.50, and this is the range of values used in the calculation of labour's share of the burden of a payroll tax.

Application of the Model to the Shifting of the EHT

Table 12 shows the share of the EHT borne by labour with demand and supply elasticities over the range of values suggested in the previous sections of this paper. These calculations are based on the 1990 level of total remuneration and assume that, in the absence of the EHT, OHIP premium revenue would have been equal to $1.859 billion and that the burden imposed by these premiums would have been borne by labour. The calculations also include the effect on the supply of labour of the one-percentage-point increase in the provincial personal income tax rate that accompanied the switch to the EHT in 1990. If one adopts as the base case the Keil and Symons (1990) estimate of −2 for the elasticity of demand and assumes that the aggregate supply of labour is fixed, then the model predicts that about 92 per cent of the burden of the EHT will be borne by labour through a decline in their real wage rates. Labour does not bear all of the EHT burden in this case because the elimination of the OHIP premiums is assumed to reduce the supply of labour by way of an income effect that increases the demand for leisure. Table 12 also indicates that labour's share of the EHT burden may be as high as 99 per cent if the elasticity of demand for labour is −4.50 and the elasticity of supply is −0.10, and that it could be as low as 82 per cent if the elasticity of demand for labour is −1.35 and the elasticity of supply is 0.10.

To conclude, the basic demand and supply model predicts that labour would bear around 90 per cent of the burden of the EHT given the current state of knowledge concerning the aggregate elasticities of demand and supply of labour in a Western developed economy.

Four Caveats

These results are only "back of the envelope" calculations, but they are, none the less, important because they illustrate why so many economists believe that payroll taxes are borne by labour even when they are levied on employers. However, most economists would apply four important caveats to these results.

First, the model assumes that one is dealing with a competitive labour market. In reality, we know that wage rates in many markets are determined on the basis of negotiations between unions and employers, and in these cases we have a significant departure from the competitive model. In recent years, economists have paid greater attention to the effect that unions may have on the determination of

TABLE 12
Labour's Share of the EHT Burden

Elasticity of the demand for labour, ε	Elasticity of the supply of labour, η		
	−0.100	0.000	0.100
−1.35	0.968	0.887	0.817
−2.00	0.979	0.924	0.874
−4.50	0.991	0.966	0.942

Calculations by the author

wage rates and on how taxation may affect their negotiated wage settlements; see, for example, surveys by Oswald (1985) and Creedy and McDonald (1991) on theoretical models of union behaviour. These models indicate that a general payroll tax may not be borne by labour even if the supply of labour is completely inelastic because increased taxation may trigger higher wage demands by unions. However, the analysis of union wage behaviour, even within the simple models discussed in the papers cited above, is rather complicated and most models do not yield unambiguous predictions concerning the relationship between increases in taxes and union wage demands. The source of this ambiguity is the usual one in economic models – tax-rate increases produce offsetting substitution and income effects – and, therefore, the effect of unions on the distribution of the payroll tax burden must be determined on the basis of econometric studies. Some of the results of econometric studies of the impact of payroll taxes on union wage bargaining are surveyed in the next section of this paper.

A second caveat concerning the predictions of the conventional demand and supply model is that it assumes that real wages are completely flexible and adjust in response to the introduction of a payroll tax to equate the demand and supply of labour. Thus, in the basic competitive model, a payroll tax does not lead to (involuntary) unemployment; any reduction in employment is accompanied by a decline in the amount of labour that workers are willing to supply. In reality, nominal wages may be fixed in the short term because of minimum-wage laws and union wage contracts, and the nominal prices of many goods and services are adjusted only periodically, in part because price adjustment is often costly. As a consequence, an unanticipated payroll tax increase may have a greater impact on employment than is predicted by the conventional model, and the incidence of the tax may be significantly altered. One study that has

addressed the question of how the incidence of a payroll tax is affected by adjustment lags is by Hamermesh (1980). Given reasonable assumptions concerning the adjustment rates of labour demand, labour supply, and the wage rate, Hamermesh (1980, 761) concluded that the eventual impact of the payroll tax was delayed for several years, and that even if the long-run supply of labour is completely inelastic, "the short-run burden is partly on capital and it persists over a substantial number of years." Further evidence that the short-term rigidity of wages and prices affects the impact of taxes on the economy is contained in a study by Poterba, Rotemberg, and Summers (1986).

The third caveat concerns the assumption in the conventional model that the payroll tax is levied at the same rate on all employers. This is clearly not the case with the EHT because larger employers are taxed at twice the rate that is imposed on small employers and because the self-employed, when they are eventually taxed, will be assessed at a lower rate because of the $40,000 exemption. The lower rate for small business has the effect of altering the effective rate across industries, as was indicated in table 6. Those results indicated that the effective rate on manufacturing was relatively high and the effective rate on the retail sector was relatively low. While the rate differential is relatively low because the current EHT rates are quite low, this effect could become more important if the EHT rates are increased and the relative rates on large and small employers is maintained. Determining the effect of different effective payroll tax rates on the economy would require the construction of a rather large computable general equilibrium model because of the many interactions among the sectors involved here (for example, the manufactured goods are purchased by the retail sector). Still, one might speculate that the net effect would be to shift some of the EHT burden to capital (assuming that the supply of capital to the Ontario economy is not perfectly elastic) because the sectors of the economy with the relatively high effective EHT rates will also be relatively capital intensive.

A fourth caveat concerns the role that adjustments in wage rates play in equating the demand and supply of labour. Efficiency wage models, as described by Yellen (1984) and Akerlof and Yellen (1986), have challenged the assumption that, in a competitive labour market, real wages will adjust to eliminate all unemployed labour. Efficiency wage models stress the fact that firms can increase productivity or reduce costs by paying higher wages because this will reduce labour turnover, increase employee morale, or reduce shirking by employees. Consequently, firms may not reduce their real wage rate in the face

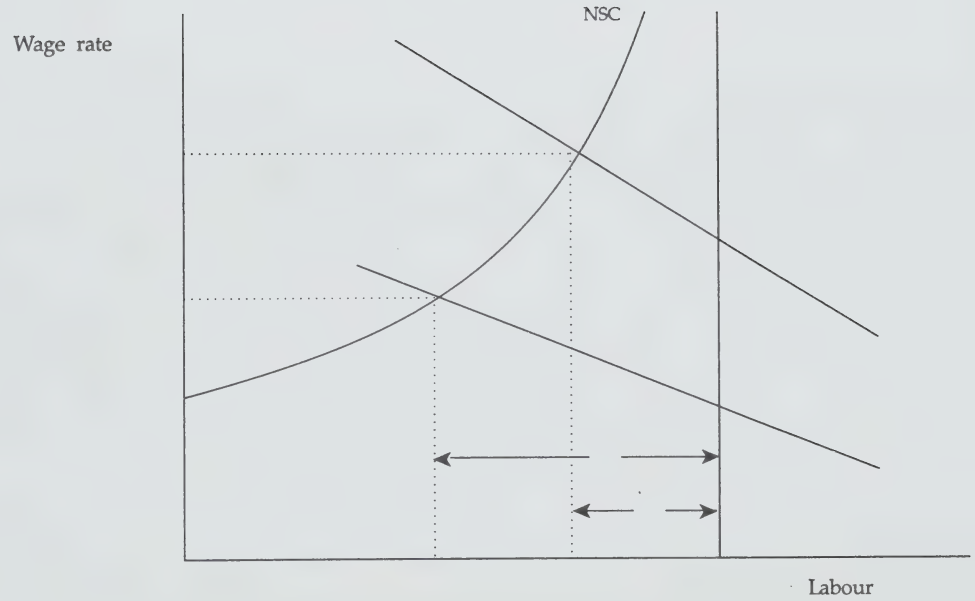
of an excess supply of labour because the resulting decline in labour productivity would increase their marginal cost of production.

The Shapiro and Stiglitz (1984) efficiency wage model is used to illustrate the effect of a payroll tax on the equilibrium or "natural" unemployment rate in figure 8.[20] The major assumption of the Shapiro and Stiglitz model is that individuals can vary the effort that they put into the work that they perform for a firm. However, monitoring an employee's effort is costly and incomplete, and, therefore, the probability that an employee who shirks will be discovered and dismissed is positive, but less than one. To provide employees with an incentive not to shirk, the firm has to make dismissal costly. It does this by paying more than the market clearing wage, thus making the pay reduction of a dismissed employee so large that shirking is not an attractive option. In figure 8, it is assumed that the supply of workers is completely inelastic, as depicted by curve S_0. The combinations of the wage rate and the level of employment such that workers will not have an incentive to shirk is given by the no-shirk constraint (NSC). The horizontal distance between the NSC and the supply curve of workers is the level of unemployment. When the level of unemployment is high, the wage that will induce employees not to shirk is relatively low. When unemployment is lower, the wage rate must be higher in order to give workers an incentive not to shirk. Hence, the NSC always lies to the left of S_0, and it has a positive slope. In the absence of a payroll tax, the demand for labour is D_0. The equilibrium wage rate and employment level are determined where the demand curve for labour intersects the NSC and are equal to W_0 and E_0. The equilibrium level of unemployment is $L_0 - E_0$, or U_0. There is no incentive for firms to lower wages to hire some additional unemployed workers because this would simply cause the firms' existing workers to shirk, resulting in lost production.

The effect of an employer payroll tax is to shift the demand curve for labour down to D_1. In the new equilibrium, the real wage rate falls to W_1, employment declines to E_1, and the level of unemployment increases to U_1. Thus, the efficiency wage model predicts that an *ad valorem* employer payroll tax will be borne by workers through both a reduction in the real wage rate and an increase in the unemployment rate, but that some of the burden may be borne by capital even if the observed supply of labour is completely inelastic.

The efficiency wage model can thus explain the persistence of unemployment and the failure of the real wage rate to adjust to eliminate unemployment. While it is not the only model that can explain the

Figure 8



existence of involuntary unemployment, it does provide a theoretically consistent framework for evaluating the econometric evidence on the effect of payroll taxes on unemployment, which will be reviewed below.

Thus, the four caveats discussed above – non-competitive labour markets, lags in wage and price adjustment, different effective payroll tax rates across industries, and efficiency wages – suggest that the burden borne by labour may be somewhat lower than is predicted on the basis of the simple demand and supply model.

The Incidence of Payroll Taxes: Econometric Studies

Econometric studies of "payroll tax-shifting" use statistical techniques to measure the impact of employer payroll taxes on wage rates.[21] These studies, which are listed in table 13, can be categorized into four groups based on the model underlying the analysis – labour demand models, labour demand and supply models, Keynesian and Phillips curve models, and wage bargaining models.[22]

Labour Demand Models

The earliest studies of payroll tax incidence were based on the estimation of a single equation derived from a labour demand model. The regression equations had the following form:

$$\log w = \alpha_1 + \alpha_2 \log \frac{Q}{L} + \alpha_3 \log (1 + t) + \alpha_4 \log X \qquad (3)$$

where w is the real wage rate paid to employees, Q is total output, L is the amount of labour employed, t is the payroll tax rate paid by employers, X represents other variables that may affect the demand for labour, and the αs are the estimated coefficients. (In some of these studies, equation 3 is rewritten so that it resembles a demand function, with L as the dependent variable on the left-hand side of the equation and w on the right-hand side.) Since Q/L is a measure of labour productivity, α_2 can be expected to be a positive number. The coefficient α_3 is referred to as the tax-shifting coefficient. If the estimated value of α_3 is -1, the authors interpreted this to mean that the full burden of the employer payroll tax is borne by labour. That is, an increase of a one percentage point in the payroll tax would be as-

TABLE 13
Econometric Studies of Payroll Tax Shifting

Author	Data Set	Conclusion
	Labour Demand Models	
Brittain (1971)	U.N. data on the manufacturing sector in 64 countries in 1958	"... the entire employer tax is shifted to labour." (p. 121)
Brittain (1972)	27 U.S. two-digit industries 1947–65	"... neither the individual industry picture nor the outcome based on pooling offers a resounding endorsement of the full-shifting hypothesis." (p. 79)
Vroman (1974b)	Same as Brittain (1971)	Zero shifting and full shifting are both consistent with the data.
Vroman (1974b)	OECD data for 19 countries for 1958, 1961, 1964, and 1967	"... employer payroll taxes do not reduce capital's relative share in total income." (p. 196)
Leuthold (1975)	U.S. private non-farm business sector, 1948(I)–1965(II)	"... the hypothesis that labour bears the full burden of the payroll tax in the United States must be rejected." (p. 10)
Beach and Balfour (1983)	U.K. manufacturing 1956(I)–1978(II)	"... the proportion that is actually shifted back on to labour is 45–60 per cent for prime aged males and only 14–19 per cent for married women." (p. 45)
	Models of Labour Demand and Supply	
Hamermesh (1979)	Data on the earnings of 587 white adult males in the U.S. in 1973	"... at most only one-third of any flat-rate payroll tax increase is shifted by employers onto labor." (p. 1217)
Holmlund (1983)	Mining and manufacturing in Sweden, 1951–79	"... only a fraction of postwar payroll tax increases has been directly shifted back onto labor as lower wage increases." (pp. 9–10)
Hughes (1985)	Transportable goods industries in Ireland, 1953(III)–1980(IV)	Only part of the payroll tax is shifted to labour in the short term.
	Keynesian and Phillips Curve Models	
Weitenberg (1969)	The Dutch economy	Just over 80 per cent of a payroll-tax increase is borne by labour in the short term.

TABLE 13 continued

Vroman (1974a)	U.S. manufacturing sector, 1956(I)–1967(I)	"Probably less than half of the [employer payroll] tax comes out of money wages." (p. 202)
Dye (1985)	U.S. private non-farm sector, 1954–79	Neither zero shifting nor full shifting could be rejected.
	Wage Bargaining Models	
Knoester and van der Windt (1987)	Aggregate data for 10 OECD countries, 1958–81	"... the shifting forward of taxes and social security contributions is an important factor in explaining real-wage growth." (p. 161)
Padoa Schioppa (1990)	The private sector in Italy, 1961–84	"... an increase in the [employers'] social security tax rate induces in the long-run a less than proportional decrease in the nominal wage rate, mildly raising the unitary labour cost (by 1/3)." (p. 161)
Vaillancourt and Marceau (1990)	780 collective agreements signed by large firms in Quebec, 1975–84	Increases in a general employer payroll tax reduced the growth rate of wages, whereas an increase in a firm-specific payroll tax increased the growth rate of wages.
Keil and Symons (1990)	The Canadian economy, 1955–85	"... real wages are increased transiently by increases in the tax and import price wedge." (p. 11)
Pissarides (1991)	The Australian economy, 1966(III)–1986(II)	"... firms bear 63 per cent of any [payroll] taxes and workers bear the remaining 37 per cent." (p. 40)

Source: Adapted from Dahlby (1992)

sociated with a reduction of one percentage point in the wage rate received by employees. Conversely, if α_3 is equal to zero, the authors interpreted this to mean that labour does not bear the employer payroll tax.

Brittain (1971) estimated the regression model described in equation 3 using cross-section data collected by the United Nations for the manufacturing sectors in 64 countries in 1958. The average effective employer payroll tax rate was estimated by adjusting the statutory rate for each country according to "the ratio of the ceiling to mean

earnings, as observed in the United States" (124). The dependent variable in the regressions was the total labour cost (excluding the employer payroll tax) measured in U.S. dollars per man-year. Brittain found that the tax-shifting coefficient was generally greater than or equal to one (in absolute value) and statistically significant. He concluded that the statistical evidence was consistent with the entire burden of the employer payroll tax being shifted to labour.

Brittain (1972) also estimated the model using time-series data for 27 industries in the United States from 1947 to 1965. The standard errors of the tax-shifting parameters in these regressions were always very large. Neither zero shifting nor full shifting could be rejected by the *t*-test for durable manufacturing. Zero shifting was rejected in one version of the model for non-durable manufacturing. Overall, few concrete results can be gleaned from this study.

Vroman (1974b) investigated some of the potential problems with the data in Brittain's 1971 study. He re-estimated Brittain's equations, using the same data that Brittain used, but with dummy variables to correct for differences in the measurement of value-added and with an alternative measure of the average effective employer payroll tax rate based on the "ratio of employer trust fund contributions to national income accounts estimates of wage and salary payments" (190). Vroman found that the standard errors for the tax-shifting coefficient increased substantially so that neither $\alpha_3 = 0$ nor $\alpha_3 = 1$ could be rejected at the 95 per cent confidence level. Vroman also reported that he estimated the revised model with United Nations data for 1964, and this produced results similar to those obtained for 1958. Consequently, Vroman's study casts considerable doubt on Brittain's conclusion that the payroll taxes of employers are fully shifted to labour.

Vroman also estimated the Brittain model using OECD data for 19 countries for the years 1958, 1961, 1964, and 1967. He argued that these data were superior to the United Nations data that Brittain used because the value-added and effective average employer payroll tax rate variables were measured on a more consistent basis and because these data covered the entire economy and not just the manufacturing sector. He found that the estimates of the tax-shifting coefficient were positive, significantly different from zero, but not significantly different from one. Vroman (1974b, 195) interprets these results as indicating that "labor's relative income share, net of the employer tax, declines by one unit per each unit increase in the employer payroll tax." He declined to comment on the overall incidence of the em-

ployer payroll tax because he claimed that the single-equation model does not allow for the general equilibrium feedbacks that are necessary to draw such conclusions. Still, the results of this study seem to be consistent with the results of the Brittain (1971) study.

Leuthold (1975) analysed payroll tax shifting using quarterly data on the private non-farm business sector in the United States from 1948(I) to 1965(II). The dependent variable in some of the regressions was the amount of labour employed (in hours), and the explanatory variables were current and lagged output, the combined employer and employee payroll tax rate, and the real wage rate. In other regressions, the dependent variable was the real wage rate, and employment appeared as an explanatory variable. Only in the regressions where employment was the dependent variable were the shifting parameters significantly different from zero. However, the point estimates were low and significantly different from one. For example, in one of these equations, an increase of one percentage point in the payroll tax rate would reduce the demand for labour by only 0.02 per cent. On the basis of these results, Leuthold concluded that "labor in the United States does not bear the primary burden of the payroll tax" (11). One problem with the study is that the author combined the employer and employee payroll tax rates. This approach confounds the analysis because, under the hypothesis that labour bears the full burden of the tax, an increase in the employer payroll tax rate should have a negative effect on the real wage rate while an increase in the employee payroll tax should have no effect. This may explain why the payroll tax rate was not statistically significant in the regressions where the real wage rate was the dependent variable.

Beach and Balfour (1983) estimated a labour demand model, using data on the manufacturing sector in the United Kingdom from 1956(I) to 1978(II). While their model is similar to the labour demand function estimated by Leuthold (1975), they paid more attention to the econometric problems, especially the specification of the lags. In their preferred model, the estimated constant-output elasticity of demand for labour was -0.38 which is in the range of values -0.15 to -0.50 that Hamermesh considered plausible. The estimate of the tax-shifting variable was close to -0.6, although Beach and Balfour (1983, 42) noted that they could not reject a value of -1 at conventional levels of significance.

Beach and Balfour acknowledged that estimation of the demand function does not, by itself, indicate the extent to which the tax burden is shifted to labour because the distribution of the tax burden also

depends on the elasticity of the supply of labour. Using labour supply elasticities between 0 and 0.2 for males, they calculated that men bear between 45 and 60 per cent of the of the employer payroll tax. Note that the upper bound of 60 per cent occurs when the elasticity of supply is zero, and it is not 100 per cent because, in their calculations, labour's share of the burden is multiplied by their estimate of the tax-shifting parameter, -0.6.

They also calculated the share of the payroll that is borne by married women to be 14 to 19 per cent because they used female labour supply elasticities of 0.8 to 1.2. This separate calculation of the burden for women implicitly assumes that it is not possible to substitute the labour of females for that of males in the manufacturing sector. I think that a more appropriate assumption is that the labour supplied by women is a perfect substitute for the labour supplied by men. Therefore, men and women will bear the same fraction of the employer payroll tax burden, assuming that employers cannot practise wage discrimination. Under these assumptions, the appropriate labour supply elasticity is a weighted average of the supply elasticities of males and females.

Feldstein (1972) has pointed out that there are a number of important conceptual problems with Brittain's study and with the other studies that have used the same methodology. Feldstein's criticisms can be summarized in four related points. First, he argued that Brittain misinterpreted the coefficient of the payroll tax variable in the estimated equations. Feldstein pointed out that if employers base their employment decisions on the total cost of a unit of labour, that is, on the wage rate and the employer payroll tax, and if the labour demand function is as shown in equation 4:

$$\log L = \beta_1 + \beta_2 \log Q + \beta_3 \log (1 + t)w + \beta_4 \log X \qquad (4)$$

where β_3 is the constant-output elasticity of labour demand, then equation 3 can be derived from the demand function in equation 4, and the coefficient of α_3 will be equal to -1. If the estimated value of α_3 is -1, this merely confirms the hypothesis that employers base their employment decision on the total cost of labour and does not convey any information about the extent to which the tax is shifted. If the estimated value of α_3 is not equal to -1, this would indicate either that the model is misspecified or that employers do not correctly perceive the cost of hiring labour. Feldstein's second criticism is that, in Brittain's equations, output per unit of labour is held constant.

Feldstein (1972, 737) maintained that this implicitly assumes that "the tax leaves the relative supply of labor and capital unchanged," thus ignoring potentially important economic adjustments. Third, Feldstein claimed that Brittain had implicitly assumed a "one-good" economy. In a "many-good" economy, with labour perfectly mobile between industries, a payroll tax that is levied at the same rate on all industries will alter their relative product prices according to the labour intensities of the industries. To the extent that earners of labour and capital have different propensities to consume products, important distributional effects of the payroll tax were ignored by Brittain. Finally, Feldstein argued that Brittain's approach could not provide an answer to the question of payroll tax incidence because Brittain estimated the demand for labour, but ignored the supply of labour. In Feldstein's view, "a proper assessment of the incidence requires an estimate of a simultaneous equations model of the supply and demand for both labor and capital. Ideally, the study should also show the effects of the tax on the relative prices of the goods consumed disproportionately by labor and the owners of capital" (738). I think that Feldstein's critique of Brittain's study is very compelling. Feldstein has challenged other economists to estimate the incidence of the payroll tax using a multi-equation model. This challenge has been addressed in some of the papers considered in the following sections, but no study has developed models that incorporate the markets both for labour and for capital.

Labour Demand and Supply Models

As noted by Feldstein, one of the problems with the approach pioneered by Brittain is that one cannot make inferences about the extent to which a payroll tax is shifted just by analysing the demand for labour. Both the demand for labour and the supply of labour have to be considered.

The challenge of incorporating both the demand and supply of labour in the analysis of payroll tax shifting was taken up by Hamermesh (1979). He estimated a regression equation with average hourly earnings as the dependent variable and included explanatory variables that influence both the demand and the supply of labour. The data were based on a cross-section of 587 adult white males in the United States in 1973. The explanatory variables included a measure of intelligence, hours worked in 1973, years in the workforce, dummy variables for the size of the urban area, industry, educational attain-

ment, geographic region, the average payroll tax rate in 1973, and lagged values of the payroll tax rate for six previous years. Hamermesh claimed that a coefficient of zero on the payroll tax rate variable should be interpreted as indicating zero shifting of the employer payroll tax and that a coefficient of −1 should be interpreted as complete shifting. Because 67 per cent of the individuals in the sample earned more than the 1973 ceiling on contributions, Hamermesh measured the payroll tax rate for this group by the ratio of the maximum contribution to the individual's earnings in 1973. He argued that one of the advantages of using his cross-section data was that the variation in measured payroll tax rates was much larger than that obtained in the typical time-series study using aggregate data, but he noted that this way of defining the payroll tax rate introduces a negative bias into the estimated coefficients of the tax rates because an increase in average earnings (not explained by the other independent variables) will be associated with a decline in the measured average tax rates. Consequently, the absolute value of the ordinary least squares coefficient estimate for the payroll tax rate will tend to be too large in absolute value. Therefore, he argued that it should be interpreted only as an upper bound on the extent to which the employer payroll tax is shifted backward to labour. In the estimated ordinary least squares equation, the coefficients on the current and lagged tax rate variables summed to about −36, and Hamermesh (1979, 1214) interpreted this result as indicating that "in the long-run only 36 per cent of the tax is borne by labor as lower wage rates."

Asher (1984) has argued that the problem of bias in Hamermesh's coefficient estimates is very severe because the anticipated bound for the tax-shifting coefficient was −1, whereas the estimated value was −36. Therefore, Hamermesh's results imply that labour's burden is 36 times as large as the payroll tax, and not 36 per cent of the payroll tax. Obviously, this is not a credible result. Hamermesh (1984) has acknowledged the error in his interpretation and the severity of the bias in his ordinary least squares parameter estimates, but he pointed out that he also estimated the equation using an unbiased maximum-likelihood technique, and it indicated that the shifting parameter was zero.

Unfortunately, there are still a number of problems with Hamermesh's study. First, the maximum-likelihood technique was applied to an equation that included only the current tax rate. It is reasonable to suppose that there are lags in the adjustment of nominal wage rates to payroll tax rates, and the lagged values should have been

included in the estimated equation. Second, the measured degree of tax shifting did not include the tax burden borne by labour through increases in the price level because there was no adjustment in the wage rate to reflect variations in the cost of living. A third problem is that Hamermesh incorporated the effects of the payroll tax on workers above the ceiling using the average effective tax rate when these taxes have only an income effect and a zero marginal rate.[23] These problems severely limit the usefulness of the Hamermesh results, but his paper and the exchange with Asher have served to highlight the problem of bias that may result from the common practice of measuring the payroll tax rate as the ratio of contributions to earnings.

Holmlund (1983) has made the most progress in integrating the demand and supply of labour into the analysis of payroll tax shifting. He postulated a model with a log linear demand function for labour, similar to equation 4, in which the demand for labour depends on $(1 + t)w/P_Q$ where t is the employer payroll tax rate and P_Q is an output price index. A log linear labour supply function was also postulated in which the supply of labour is affected by the real wage rate net of the income tax, $(1 - \tau)w/P_C$ where τ is the income tax rate and P_C is the consumer price index. Assuming that the wage rate equates the demand and supply of labour, he combined the two equations to obtain a single equation determining the money wage rate. The independent variables in that equation included the producer price index, P_Q; the consumer price index, P_C; one plus the employer payroll tax rate, $(1 + t)$; the income retention rate, $(1 - \tau)$; and the proportional deviation from the trend output. All of the variables, except the output trend, were included in the estimated equation as first differences in the logarithms.

The advantage of Holmlund's approach is that the coefficients of this equation can be interpreted as combinations of the elasticities of the demand and supply of labour, and therefore restrictions on the estimated coefficient can be tested. In particular, his model predicts that:

a. the coefficients on the variables $(1 + t)$ and P_Q should have equal but opposite signs because the demand for labour depends on the cost of a unit of labour relative to the price of output;
b. the coefficients on the variables $(1 - \tau)$ and P_C should have equal but opposite signs because the supply of labour depends on the real after-tax wage rate; and
c. the sum of the coefficients on P_Q and P_C should equal 1 because

it is assumed that workers and employers are not subject to money illusion.

Holmlund estimated the model using annual data from the mining and manufacturing sector in Sweden, from 1951 to 1979. He found that neither restriction (a) nor restriction (b) could be rejected, but that restriction (c) was rejected. He attributed the rejection of this restriction to money illusion. The model with all three restrictions imposed was also rejected. The coefficient estimates from the unrestricted regression model implied that the ratio of the elasticity of demand for labour to the elasticity of the supply of labour was about −2.5. Therefore, using equation 1, this implies that labour bears about 70 per cent of the payroll tax burden. However, in the regression with all three restrictions imposed, the ratio of the elasticity of demand for labour to the elasticity of the supply of labour was about −0.75, and, from these estimates, Holmlund concluded that labour bears only about 35 per cent of the employer payroll tax.

Holmlund's conclusion with regard to the incidence of the payroll tax can be challenged on three grounds. First, it is based on the coefficient estimates from the version of the model that imposed restrictions on the coefficients rejected by the conventional statistical test. The unrestricted model yielded more reliable coefficient estimates consistent with parameter estimates from other econometric studies. For example, Holmlund's unrestricted coefficient estimates and constant-output elasticities of demand for labour in the −0.15 to −0.50 range imply that the labour supply elasticity is in the range 0.06 to 0.20. In contrast, the fully restricted coefficient estimates imply that the labour supply elasticity is in the range 0.20 to 0.67, a range of values that is much higher than most economists think reasonable. Consequently, the unrestricted coefficient estimates are more credible, and they imply that labour bears at least 70 per cent of the employer payroll tax burden. Second, Holmund's procedure for calculating payroll tax incidence ignores the feedback effect from higher wages to higher consumer prices. Holmlund acknowledged this limitation, and he conjectured that "labor will presumably bear the full burden of payroll tax increases in the long run" (13) because increases in the cost of labour to employers will ultimately lead to increases in consumer prices. Third, the labour demand elasticities assume constant output, and, as Feldstein argued, a variable-output elasticity of demand for labour is a more appropriate concept, in which case the share of the burden borne by labour would be correspondingly greater.

Hughes (1985) also estimated the Holmlund model using quarterly data on the transportable goods industries in Ireland from 1953(III) to 1980(IV). His coefficient estimates were remarkably similar to those obtained by Holmlund for Sweden, and it is interesting to note that the fully restricted version of the model was also rejected using the Irish data. The same comments that were made regarding Holmlund's conclusions apply with equal force to the results from the Hughes study.

Keynesian and Phillips Curve Models

In view of the formal rejection of the conventional labour demand and supply models estimated on the data from Sweden and Ireland, it is prudent to investigate alternative models. Some early attempts to investigate payroll tax incidence using Keynesian and Phillips curve models are described below. I then examine the most recent work based on models of the wage bargaining process.

Weitenberg (1969) simulated the effect of a 1 per cent increase in payroll taxes in the Netherlands in 1967 using a large Keynesian macro-economic model. He found (table 3, 204) that, after three years, the effect of the tax was to increase the nominal money wage by about 0.25 per cent and to increase the consumer price level by 0.07 per cent, resulting in a decline in real disposable income per worker of 0.81 to 0.86 per cent. The model also predicted an increase in unemployment, a reduction in the volume of exports and investment, and an increase in private consumption. He also reported some simulations where capital-labour substitution was permitted. These simulations indicated that, in the long run, more of the payroll tax burden was borne by labour and the impacts on unemployment and exports were even larger.

Weitenberg's study was a useful contribution to this literature because it incorporated the linkage between wages and prices and other important feedback mechanisms that, except the most recent studies by Padoa Schioppa (1990) and Pissarides (1991), have been neglected in all other studies. However, one may question whether a Keynesian model is the appropriate tool for the study of the long-run incidence of a payroll tax, given that price inflexibility and a high degree of aggregation that characterize models of this type and vintage. In addition, it is not clear whether the study investigated the absolute incidence of a payroll tax increase, which might explain the increase in unemployment, or the balanced budget incidence with the in-

creased tax revenues redistributed to workers, which would account for the slight increase in private consumption spending. The failure to explain the effect on the government budget is a serious shortcoming. A third problem with the Weitenberg study is that there is no "confidence interval" for the calculations of labour's burden from the payroll tax – the computation of such a confidence interval being an extremely difficult problem in a large econometric model. The absence of any discussion of the sensitivity of the results to alternative specifications of the model (such as are routinely reported in applied general equilibrium modelling) gives the illusion that the results are more precise than those that are obtained from single-equation models where standard errors of estimated parameters are often fairly large.

Vroman (1974a) estimated a Phillips curve model using data on the manufacturing sector in the United States for the period 1956(I) to 1967(I). The growth rate of money wages was the dependent variable and the explanatory variables included the unemployment rate, the growth rates of consumer prices, profits, employer payroll taxes, and other labour income. He found that the estimated coefficients on the current and lagged tax variable had large standard errors and concluded that it is difficult "to judge precisely the extent of backward shifting. Fractions like $^1/_4$ or $^1/_2$ seem to be reasonable estimates" (201).

One problem with studies of this type was that the dependent variable is the rate of increase in actual wages that, in the union sector at least, cannot be expected to respond to the payroll tax changes until a new contract is negotiated. It is not clear whether the lags that Vroman used (up to five quarters) were long enough to capture the effects of the payroll tax changes. Furthermore, the estimate of tax shifting does not include any burden that would be borne by workers as a result of increases in the price level. Most importantly, the model suffers from the general problem of the Phillips curve models of the late 1960s and early 1970s in that price expectations are crude and naïve. The coefficient on the lagged rate of price increase is between 0.13 and 0.22, indicating money illusion in the setting of wages.

Dye (1985) also estimated a Phillips curve model using data for the U.S. economy. Two alternative indices of the growth rate of average hourly earnings were used as the dependent variable. The explanatory variables included the deviation from the natural rate of unemployment; the rate of increase in the CPI; and a number of alternative measures of the employer payroll tax rate, including a broad measure (total employer contributions to social insurance), a narrow measure

(employer contributions to social security and railroad retirement) combined with unemployment insurance contributions, as well as the statutory Old Age Survivors Disability and Health Insurance (OASDHI) employer payroll tax rate. In all cases, the standard errors of the estimated coefficients were so large that neither zero shifting nor full shifting could be rejected.

The Keynesian and Phillips curve models were early attempts to break out of the conventional demand and supply framework and provide a more reliable analysis of the wage adjustment process in Western developed economies. Unfortunately, the absence of a strong theoretical foundation has rendered much of this empirical work very suspect in the eyes of most economists.

Wage Bargaining Models

The challenge of providing a theoretically sound alternative to the conventional demand and supply framework has been taken up in a number of recent studies. The common theme of these studies is that wage determination in most Western countries is strongly influenced by wage bargaining involving labour unions. The results of these studies are examined below.

Knoester and van der Windt (1987) estimated a wage bargaining model using data for 10 OECD countries, including Canada, for the years 1958 and 1981. The model treated the actual growth rate of wages as a weighted average of the wage offers of employers and the wage claims made by workers where the relative weight on the wage claims workers was inversely related to the unemployment rate.[24] They assumed that workers try to shift the burden of higher direct taxes and social-security contributions by obtaining higher wages and that firms reduce their wage offers if there is an increase in the employer payroll taxes. The dependent variable in their regressions was the growth rate of real wage costs per worker, including social-security contributions paid by employers. The explanatory variables included the growth rate of direct taxes and social-security contributions, the difference in the growth rates of consumer and GDP prices indices (which reflected the effects of changes in indirect taxes and the terms of trade that were postulated to have a negative effect on the real growth rate of wages), the productivity growth rate, and the unemployment rate. The coefficients of the taxation and productivity variables were positive and significant for all the countries. The coefficient of the difference in the growth rates of consumer and GDP prices was

negative and significant for Canada, Germany, Sweden, and the United Kingdom. The unemployment rate was not a significant determinant of the growth rate of the real wage rate in five of the countries, including Canada.

Knoester and van der Windt interpreted the coefficient on the tax variable as indicating complete forward shifting if its value was equal to one, partial forward shifting if it was positive but less than one, and that overshifting took place if it was greater than one. On this basis, they concluded that partial forward shifting occurred in Canada, France, Sweden, the United Kingdom, and the United States. Complete forward shifting was indicated for Germany, Italy, Japan, and the Netherlands. Overshifting was indicated for Australia.

The Knoester and van der Windt approach to estimating payroll tax incidence is very interesting, but the paper has many blemishes because the presentation of the model, the definition of the variables, and the description of the data were inadequate. Two specific problems with the paper are, first, that it is difficult to interpret the coefficients estimated by Knoester and van der Windt in terms of the extent to which the payroll tax burden is borne by labour, in part because the dependent variable and the tax rate variable were both measured as growth rates, and, more important, the dependent variable included both the employer and employee social-security contributions and direct taxes. The second problem was that the specification of the model was incapable of measuring the long-run incidence of the direct taxes and social-security payroll taxes because the only equation that contained a lagged tax variable was the one estimated for the United States, and it contained only a weighted average of the current and previous year. Only the current growth rates of taxation were included in the other regressions. Further analysis would help to clarify whether the full- or partial-shifting results would be substantially altered if longer lags were incorporated in the regressions.

Padoa Schioppa's (1990) study is an interesting departure from the usual competitive equilibrium analysis because it utilized a wage determination model in which a union chooses the wage rate and employers choose the level of employment.[25] The union's objective function contained the net real wage rate and the level of employment. It was shown that the optimal wage rate from the union's perspective depends on the elasticity of demand for labour, the progressivity of the income tax system, and the union's willingness to trade off the real wage rate for increased employment.

Within this framework, Padoa Schioppa developed a four-equation econometric model in which the endogenous variables were the first differences in the logs of the wage rate and employment, the log of an output price index, and the income tax rate. The model was estimated using data for the private sector of the Italian economy over the period 1961–84. In the wage rate equation, the explanatory variables included indices of output and consumer prices, measures of unemployment and labour productivity, the sum of the social-security tax rate levied on firms and the net indirect tax rate, the income tax rate, and a time trend. A steady-state solution, incorporating feedbacks from wages to prices, indicated that about two-thirds of the employer payroll tax was borne by labour. This contrasts sharply with Knoester and van der Windt's conclusion that payroll taxes were not borne by labour in Italy. The Padoa Schioppa results indicate Knoester and van der Windt may have underestimated seriously the amount of the extent of the burden borne by labour by failing to incorporate the feedback effect of higher wage costs on prices.

Vaillancourt and Marceau (1990) estimated a wage equation using data from 780 wage contracts signed by large firms in Quebec over the period 1975–84. The dependent variable was the negotiated growth rate of the base wage rate, and the explanatory variables included vacancies, the growth rate of the CPI, dummy variables for the presence of a COLA clause, the industry, and the period of wage and price controls, as well as two measures of employer payroll taxes in Quebec. One payroll tax variable was the rate of increase (lagged one year) in general payroll taxes (i.e., the ones used to finance unemployment insurance, the Quebec Pension Plan, health services, and labour standards). The second payroll tax variable was the rate of increase (lagged one year) in the firm-specific payroll tax levied to finance the compensation program of workers. Vaillancourt and Marceau argued that the general and firm-specific payroll taxes could have different effects on the growth rate of negotiated wages. Increases in the firm-specific compensation premiums of workers, indicating higher anticipated claims, may be accompanied by an upward shift in the labour supply curve to the firm. That is, the risk-premium that workers require in order to work for that firm may also increase if the benefits from the compensation of workers do not completely compensate workers for their injuries.

Vaillancourt and Marceau found that the coefficient of the firm-specific payroll tax variable was positive and significant, a result consistent with the risk premium explanation. The general payroll tax

variable was negative and significant in one of the two estimated versions of the model. The results can be interpreted as indicating that labour's share of the payroll tax burden of employers was between 0.303 and 0.478. Note, however, that this does not include any of the tax burden borne by labour through forward shifting of the employer payroll taxes into higher consumer prices. The hypothesis that the full burden of the employer payroll tax was shifted to labour can be rejected using a t-test at the 95 per cent confidence level.

Vaillancourt and Marceau's use of contract data to estimate the incidence of payroll taxes is a useful innovation,[26] but their study is subject to a number of criticisms. First, it is future payroll tax rates, not past rates, that are relevant for contract negotiations. Rather than using the growth rate of the payroll tax rates lagged one or more years, it would have been more advisable to use the payroll taxes that were announced prior to the signing of the contract, or even the payroll tax rates that were actually in effect during the life of the contract, assuming that firms and unions can accurately forecast payroll tax rate increases. A second criticism concerns the absence of other tax variables such as the employee payroll tax rate, the personal income tax rate, and the sales tax rate. These other tax-rate variables should have been included because, if the employer payroll tax rate affects wage bargaining, then it is reasonable to suppose that these other taxes will also affect wage bargaining. The inclusion of the other tax variables may also permit the testing of restrictions on the estimated coefficients as in the Holmlund (1983) and Hughes (1985) models. Third, it was not clear how the payroll tax variable was defined and calculated. Finally, the theoretical model underlying the regression model was not clearly specified.

Keil and Symons (1990) developed a four-equation labour market model that determines the real product wage rate, employment per unit of capital, the labour force, and the unemployment rate. The model was estimated using aggregate Canadian data for the period 1955–85, and it was developed to determine why the Canadian unemployment rate rose dramatically in the early 1980s and has remained very high since then.

The estimated coefficients of the endogenous variables and the payroll tax variable are shown below:[27]

$$\log w = -0.81\log w_{-1} - 0.14\log\left(\frac{E}{K}\right)_{-1} - 0.93u + 0.79\left(\log(1+t) - \log(1+t)_{-1}\right) + X_w \qquad (5)$$

$$\log\left(\frac{E}{K}\right) = 0.92\log\left(\frac{E}{K}\right)_{-1} - 0.20\log w + X_E \quad (6)$$

$$\log L = 0.95\log L_{-1} - .34u + X_L \quad (7)$$

$$u = \log L - \log_E \quad (8)$$

where w is the real product wage rate, E/K is the employment per unit of the capital stock, u is the unemployment rate, t is the payroll tax rate, L is the labour force, and the Xs represent the other exogenous variables that affect wage rates, employment, and the labour force. Lagged variables are denoted with a subscripted −1. Keil and Symons found that the *level* of payroll taxation did not affect the real product wage, but a *change* in the payroll tax rates did affect it. This implies that a once-and-for-all increase in a payroll tax would have a transient effect on the real product wage, but not a permanent effect. Keil and Symons (1990, 14) opined that this transient effect occurred because "in wage bargaining, it is costly to change the consumption wage, which means that increases in the [tax] wedge have a short-run effect on unemployment, but no long-run effect." Other significant features of the model include the fact that an increase in the unemployment rate leads to a reduction in the real product wage rate and to a decline in the labour force. The latter is known as the discouraged worker effect. Keil and Symons found that the primary reason for the increase in the unemployment rate in the 1980s was the 1971 liberalization of the unemployment insurance system. They claimed that the effects of the liberalization were not apparent until the 1980s because of favourable movements in export prices in the 1970s.

While changes in taxes have only transient effects on the real wage rate, their impact on labour market performance is *not* negligible because the lag structure in Keil and Symons's model implies that the impact of a once-and-for-all tax increase is felt for a very long time. In table 14, I have calculated the effect of a permanent one-percentage-point increase in the payroll tax rate under the assumption that the capital stock remains constant. The immediate consequence is to increase the real product wage by about 0.6 per cent and to reduce employment by about 0.1 per cent. The unemployment rate increases by about 0.1 percentage points despite a small decline in the labour force. The table also shows that, while the impacts on the wage rate and the unemployment rate diminish rather rapidly, such is not the case for the impacts on employment and the labour force. The impacts on employment and the labour force peak in years 4 and 8, respectively, and the impacts in year 25 are greater than in year 1. Thus,

TABLE 14
The Effect of a One-Percentage-Point Payroll Tax Rate Increase in Canada, Based on the Keil and Symons (1990) Model

	Percentage change in:			
Year	Real product wage rate w	Employment E	Labour force L	Unemployment rate u
1	0.631	−0.126	−0.032	0.095
2	0.412	−0.198	−0.073	0.125
3	0.248	−0.232	−0.110	0.122
4	0.139	−0.241	−0.139	0.102
5	0.074	−0.236	−0.158	0.078
6	0.041	−0.225	−0.169	0.056
7	0.028	−0.213	−0.174	0.039
8	0.027	−0.201	−0.175	0.027
9	0.033	−0.191	−0.173	0.019
10	0.040	−0.184	−0.169	0.015
11	0.046	−0.178	−0.165	0.013
12	0.051	−0.174	−0.162	0.013
13	0.054	−0.171	−0.158	0.013
14	0.055	−0.168	−0.155	0.014
15	0.055	−0.165	−0.152	0.014
16	0.055	−0.163	−0.149	0.014
17	0.054	−0.161	−0.146	0.014
18	0.053	−0.158	−0.144	0.015
19	0.052	−0.155	−0.142	0.015
20	0.051	−0.154	−0.139	0.014
21	0.049	−0.151	−0.137	0.015
22	0.048	−0.148	−0.135	0.014
23	0.048	−0.145	−0.133	0.013
24	0.047	−0.144	−0.131	0.013
25	0.046	−0.142	−0.129	0.013

while it is true that a tax increase does not have a long-run impact on the labour market, the "transient" effects persist for a quarter of a century, and these effects should not be ignored.

Consequently, the Keil and Symons model indicates that, in the short run (say three years), a significant portion of the burden from a payroll tax increase is borne by firms, even though the entire burden is borne by labour in the long run. This bolsters the conclusion reached by Hamermesh (1980) that the transitional effects of payroll tax increases are important. Two caveats concerning this analysis of the impact of a payroll tax increase should be mentioned. First, the simulations assumed that the capital stock remained constant. To the extent that some of the burden is borne by capital in the short run, this may lead to a reduction in investment that would moderate the

wage increase and shift more of the burden to labour. Second, the simulations show that some of the short-term burden of the payroll tax increase is actually borne by labour, not through lower real wage rates, but through a reduction in employment opportunities. Both of these factors make it difficult to assess how much of the short-term burden of a payroll tax increase is borne by labour. One further point to bear in mind concerning the Keil and Symons model is that an increase in the income tax or indirect taxes would have the same effect as a payroll tax increase.

Pissarides (1991) estimated a four-equation model of the Australian labour market that is, in many respects, similar to the model developed by Keil and Symons. The specification of the model is as follows: "(1) for real wages, in terms of the capital stock, unemployment, hours of work, taxes, subsidies, inflation expectations and income policies; (2) for employment, in terms of the capital stock, real wages, hours of work, real interest rate, competitiveness and two measures of aggregate demand policies; and (3) for [labour force] participation, in terms of employment, wages and demographics" (37). Pissarides noted that the model could be derived from a variety of frameworks, but his preferred interpretation was that of a wage bargaining model in which unions determine the wage rate; firms determine the level of employment, given the wage rate; and individuals decide on whether or not to participate in the labour force, given the wage rate and the employment level.

The equations of the model were estimated using quarterly data for the Australian economy over the period 1966(III) to 1986(II). The estimated long-run coefficients of the endogenous variables and the payroll tax variable are shown below:[28]

$$\log (1 + t)w = -1.36 \log L + 0.63 \log t + X_w \quad (9)$$

$$\log E = -0.79 \log (1 + t)w + X_E \quad (10)$$

$$\log L = 0.36 \log E + X_L \quad (11)$$

$$u = \log L - \log E \quad (12)$$

where the symbols have the same interpretation as in the Keil and Symons model. Equation 9 indicates that a 1 per cent increase in the payroll tax rate would increase the real product wage rate by 0.63 per cent in the long run, and, on this basis, Pissarides concluded that "firms bear 63 per cent of any taxes and workers bear the remaining

37 per cent." Pissarides also found that "payroll taxes are shared between the firm and worker very much as income and expenditure taxes are, even though the former are levied on firms and the latter on households" (1991, 40). Other important features of the model are that (a) the real wage rate declines when the labour force increases, (b) the elasticity of the demand for labour was −0.79, and (c) the labour force decreases when employment decreases – another way of describing the "discouraged worker" effect. Another significant finding was that the real after-tax wage rate did not have a significant effect on the labour force participation rate.

If the effect of an increase in the payroll tax rate incorporates the feedback effect from wage rate increases to employment and the labour force changes, then a 1 per cent increase in the payroll tax rate would result in a 1.03 per cent increase in the real product wage. The steady state increase in the wage rate resulting from a payroll tax rate increase is larger than the single-equation effect that Pissarides focused on because a wage rate increase leads to a reduction in employment, which, in turn, causes the labour force participation rate to fall. The decline in the labour force feeds back into the wage determination process, causing a further increase in the wage rate. Consequently, the results of Pissarides's research can be interpreted as indicating that the full burden of the payroll tax is borne by firms, and, therefore, his results are broadly consistent with those obtained by Knoester and van der Windt (1987) for Australia.

While the Pissarides study represents the "state of the art" concerning the effects of taxation on labour markets, a number of difficulties attend interpreting the results as indicating that most, if not all, of the tax burden is borne by firms. First, Pissarides found that the most important factor in explaining the 3.8-percentage-point increase in the average unemployment rate in Australia between 1970–73 and 1976–79 was the increase in payroll, income, and indirect taxes. Consequently, some of the burden of an increase in payroll taxation would be borne by workers suffering longer spells of unemployment. A second problem is that the analysis assumes that aggregate demand and the capital stock remain constant in the face of a payroll tax increase. The increase in unemployment accompanying a payroll tax increase might cause one to question whether aggregate demand should be assumed to remain constant when the payroll tax rate increases. A decline in aggregate demand may moderate the wage increase. Finally, the assumption that the capital stock in Australia would remain constant, in spite of the decline in the real rate of return

on capital that is implied by the tax-shifting results, seems to be at variance with my impression that the supply of capital to the Australian economy is reasonably elastic.

Conclusions

Brittain's ground-breaking study indicated that the employer payroll tax was borne by labour. Criticisms by Feldstein and Vroman have discredited his results to some extent, and numerous studies since 1975 have indicated that only a small proportion of the employer payroll tax is borne by labour. However, these studies are also subject to a number of criticisms. They generally assume that output does not change when a payroll tax is imposed, they often ignore the possibility that the payroll tax is shifted to labour through output price changes, and, in some cases, they do not adequately account for the lags in the adjustment of wages and prices in determining the ultimate incidence of a payroll tax. When these studies are re-examined in light of these criticisms, they indicate that more of the burden is borne by labour. In addition, the recent studies by Padoa Schioppa for Italy and Keil and Simons for Canada, which are free of at least some of the problems that have plagued the other studies, indicate that a substantial proportion of the employer payroll tax is borne by labour. These empirical studies, as well as the predictions from the competitive labour market model using reasonable estimates for the demand and supply elasticities of labour, suggest that labour bears over 80 per cent of the employer payroll tax burden in the long run.

Efficiency Effects of a Payroll Tax

Taxes may reduce economic efficiency by altering the allocation of resources in the economy. The total efficiency loss, which is known as the deadweight loss or the excess burden of taxation, is the reduction in well-being caused by the tax system relative to a lump-sum tax that would yield the same revenue. The social cost of raising an additional dollar of tax revenue is referred to as the marginal cost of public funds (MCPF). For many policy issues, such as determining the optimal level of public expenditure or the optimal tax mix, the MCPF, and not the total tax-induced efficiency loss, is critical. In the following sections, I will consider how the MCPF can be measured within the context of the conventional demand and supply model,

where the focus is on the impact of a payroll tax increase on employment. Then, I will consider the efficiency losses arising from the unemployment caused by payroll taxes. Finally, some of the other distortionary effects of payroll taxes will be examined, including the impacts on investment in human and physical capital, employment contracts and forms of remuneration, and the allocation of resources across industries.

The Impact on Employment

As figures 6 and 7 indicate, the conventional demand and supply model predicts that a payroll tax increase will reduce the level of employment unless either the demand for labour or the supply of labour is completely inelastic. The model predicts that the proportionate change in employment will be approximately equal to:

$$\frac{\Delta E}{E} = \frac{-\varepsilon\eta^t}{\eta - \varepsilon} \tag{13}$$

The MCPF for a payroll tax can be defined as one plus the social cost of the decline in employment when the payroll tax rate is increased to yield an additional dollar of tax revenue. Given an initial payroll tax rate t and income tax rate τ, the social cost of a decline in employment is the difference between the value of the lost output when employment falls by one unit and the opportunity cost of time of the workers. The former is given by the gross wage rate, $(1 + t)w$, and the latter by the supply price of labour, $(1 - \tau)w$. Consequently, the social cost of a decline in employment is equal to the value of the tax wedge, $(t + \tau)w$, multiplied by the reduction in employment, and the MCPF is equal to:

$$\text{MCPF} = 1 - \frac{(t+\tau)w\,\Delta E}{\Delta R} \tag{14}$$

where ΔE is the change in employment and ΔR is the change in revenue arising from a small increase in the payroll tax rate. If there is no change in employment, because either the demand for labour or the supply of labour is completely inelastic, then the marginal cost of public funds from a payroll tax will equal one dollar. To the extent that an increase in a payroll tax reduces employment, the MCPF from the payroll tax will be greater than one.

Thirsk and Moore (1991, 555) have calculated the marginal cost of public funds from the taxation of labour and concluded that "unless the benefits that marginal government spending confer on households are worth somewhere between $1.30 and $1.43 per dollar of project cost, the spending will diminish the collective welfare of Canadians." Their calculation was based on the total tax wedge created by the UI and CPP payroll taxes, the personal income tax, and the sales taxes in 1987.[29] It also incorporated a measure of the progressivity of the personal income tax system because progressive tax rates magnify the efficiency losses from taxation.

The definition and interpretation of the MCPF has been the subject of a number of recent papers, by Triest (1990b), Fullerton (1991), and Mayshar (1991). In the Mayshar's paper, alternative formulas for the MCPF were derived in a simple general equilibrium framework with a fixed stock of capital. In table 15, I have calculated the MCPF using the formula Mayshar prefers to use for cost-benefit decisions. The ranges for the elasticities of demand and supply of labour are the same as those used in the calculation of labour's share of the payroll tax burden. The average and marginal tax rates and progressivity parameter are the same as those used by Thirsk and Moore. The table indicates that the MCPF, using Mayshar's formula, is about 1.10 if the supply of labour is completely inelastic.[30] The corresponding figure using the Thirsk and Moore formula was 1.298.

To conclude, different authors have utilized different theoretical frameworks in deriving formulas for the MCPF. These formulas yield substantially different estimates of the MCPF for the same parameter values. The recent literature provides strong reasons for adopting the Mayshar formula, and this formula indicates that the marginal social cost of raising revenue through the taxation of labour may not be as severe as Thirsk and Moore have indicated.[31]

The Impact on Unemployment

The formulas for the MCPF used by Mayshar, and Thirsk and Moore do not take into account other distortions in the labour market. One important distortion that these definitions of the MCPF do not include is the effect of a payroll tax increase on the unemployment rate. As previously noted, the Keil and Symons model indicated that an increase in the tax wedge would reduce employment and increase unemployment for a considerable period of time. A study by Coe (1990) has also indicated that payroll taxes have a significant effect on un-

TABLE 15
The Marginal Cost of Public Funds from the Taxation of Labour

Elasticity of the demand for labour, ε	Elasticity of the supply of labour, η		
	−0.100	0.000	0.100
−1.35	0.975	1.092	1.201
−2.00	0.974	1.100	1.224
−4.50	0.973	1.109	1.258

Calculations by the author based on the formula for the MCPF in equation 3 in Mayshar (1991). The marginal tax rate, average tax rate, and progressivity parameter were based on the values given in Thirsk and Moore (1991, table 2) of 0.473, 0.283, and 1.66, respectively.

employment in Canada. Based on his analysis of the aggregate Canadian unemployment rate from 1971(I) to 1988(II), Coe (1990, 113) concluded that employer payroll taxes "increased the natural rate [of unemployment] by 1.5 percentage points from 1971 to the late 1970s, and by another 1 percentage point since then." The increase in the natural unemployment rate between 1970 and 1988 that Coe attributed to increases in employer payroll taxes was greater than that attributed to either increases in unionization or increases in the unemployment insurance replacement rate. He also reported that personal income taxes and indirect taxes did not have a significant effect on the unemployment rate. In his interpretation, this means that "a revenue-neutral change reducing payroll taxes and increasing other taxes would tend to lower the natural rate of unemployment" (108). Thus, Coe's study suggests that employer payroll taxes have an important effect on the unemployment rate. In this respect, his results are consistent with those obtained by Keil and Symons. However, there are also important differences between their results. Coe found that a payroll tax rate increase would permanently increase the natural unemployment rate, whereas Keil and Symons found that it would have only a temporary, albeit rather long-lasting effect. Second, Coe found that employer payroll taxes had a different impact from that of an income tax or an indirect tax increase, whereas in the Keil and Symons study the three types of taxes have the same effect.

Recent research by Milbourne, Purvis, and Scoones (1991) has indicated that temporary macro-economic shocks can have long-lasting effects on the unemployment rate in Canada. Such is the case because the number of weeks of benefits increases with the unemployment rate, which, in turn, causes more workers to be unemployed for a longer period of time. Although their research does not deal with the

financing of UI or with payroll taxation, it seems to suggest that a payroll tax increase may increase the unemployment rate, perhaps permanently, if the immediate effect of the payroll tax increase is to reduce employment. Obviously, more research is required on the impact of payroll taxes on the rate of unemployment.

There is also evidence from other countries that taxation can have an important influence on the rate of unemployment. As previously noted, Pissarides (1991) found that the increase in the tax wedge was the most important factor in explaining the increase in the level of unemployment in Australia in the 1970s. Bean, Layard, and Nickell (1986) analysed the determinants of the change in the unemployment rate in 18 OECD countries between 1956–66 and 1980–83. They found that the increase in the tax wedge accounted for over half of the change in the unemployment rate in Australia, Ireland, Italy, Sweden, and the United States. Their research indicated that the change in the tax wedge accounted for only 23 per cent of the change in the unemployment rate in Canada, with changes in aggregate demand accounting for the remainder. Whether the results for Canada are meaningful is difficult to say because the tax-wedge variable was not statistically significant in the wage equation estimated by the authors.[32] Finally, Layard and Nickell (1986, S165), who analysed the labour market in the United Kingdom from 1954 to 1983, concluded that "employers' 'taxes' on labour have risen by 13 points, and this may have increased unemployment by around 1.4 percentage points." They also concluded that there was little evidence that income taxes and indirect taxes had an impact on unemployment.

If a payroll tax increases unemployment, even temporarily, the MCPF from a payroll tax increase may be larger than was indicated in the previous section. The efficiency loss from tax-induced unemployment can be incorporated in the calculation of the MCPF if the formula for the MCPF is written in the following manner:

$$\text{MCPF} = 1 - \frac{(1 + t - \theta) w \Delta E}{\Delta R} \qquad (15)$$

where θw is the unemployed reservation wage of workers, or opportunity cost of time. With involuntary unemployment, the value of θ may range from zero to $(1 - \tau)$, but it is not directly observable.

The MCPF incorporating tax-induced unemployment can be calculated using the estimated impact of a payroll tax increase shown in table 14. The present value of the social cost of the employment

reduction and the revenue increase were calculated over a 25-year period using a 5 per cent discount rate.[33] The calculations indicate that if θ is zero, then the MCPF is 1.205. This is about 0.10 larger than the comparable figures in table 15 for the case where labour supply is completely inelastic.[34] If θ is equal to $(1 - \tau)$, which corresponds to the case where there is no involuntary unemployment, then the calculated MCPF is 1.084, which is comparable to the results in table 15.

To conclude, payroll taxes may have efficiency effects through their impact on the unemployment rate, and my preliminary attempts to incorporate these effects suggest that this may add at least 0.10 to the calculated MCPF. Further research on this topic is obviously necessary.

Other Distortionary Effects of Payroll Taxes

Human capital plays an important role in fostering economic growth. We should therefore consider how a payroll tax affects the decisions of individuals to invest in training and education. The standard economic model of investment in training and education treats these decisions as it would any other investment decision. Individuals maximize their wealth by acquiring human capital until the after-tax return on an additional dollar of human capital investment yields the same after-tax rate of return as an additional dollar invested in physical assets. Davies and St-Hilaire (1987) use this framework to provide a very thorough treatment of the effects of taxation on human capital formation. They show that "human capital investment continues at the socially optimal level under a proportional wage tax" (77). The reason why a proportional wage tax does not distort human capital decisions is that it reduces in the same proportion both the return to human capital and the opportunity cost of the forgone earnings, and it does not alter the return that an individual can earn by investing in physical capital. Thus, investment in human capital under a proportional wage tax still occurs up to the point where the marginal investment in education and training earns the market rate of return. In contrast, a proportional income tax that combines a proportional tax on wage income with a proportional tax on capital income will distort human capital investment decisions because it reduces the net return on physical capital, thereby inducing the individual to acquire human capital in excess of the socially optimal level. A progressive income tax has offsetting effects on human capital investment deci-

sions because the higher tax rates applied to wage income discourage investment in human capital, while the taxation of capital income encourages human capital investment.

The potential importance of the distortionary effect of income taxes on human capital decisions has been stressed in work by Driffill and Rosen (1983). Their partial-equilibrium analysis suggested that the distortion of the human capital decision was much more important than the distortion of the labour-leisure decision which has usually been the focus of the economic analysis of taxation on labour markets. However, a recent paper by Davies and Whalley (1991, 188) has simulated the impact of income taxes in a dynamic general equilibrium model with investment in human capital and has concluded that "estimates of intertemporal distorting costs of taxes are little affected by including human capital." Thus, the distortion of human capital decisions does not seem to provide a strong reason for shifting from an income tax to a payroll tax.

Payroll taxes may also affect the economy by altering the level of investment in physical capital. The effect of a payroll tax increase on investment is ambiguous because there will be offsetting substitution and output effects. The substitution effect of a payroll tax increases investment because the increase in the unit labour costs of employers makes the use of capital in production relatively more attractive. The output effect reduces investment because the payroll tax may cause aggregate output to decline. (The latter obviously depends on whether simultaneous adjustments are made in other taxes or expenditures.) Although much of the analysis of tax policy with regard to investment decisions is conducted within the neoclassical framework with its emphasis on user cost of capital as a determinant of investment decisions, the evidence in favour of this model is rather scanty.[35] A recent study by Ford and Poret (1991, 108) of investment in Canada and six other large OECD countries has concluded that "the neo-classical model, even when augmented with profit and uncertainty variables, is probably not consistent with the data." To the best of my knowledge, there is no econometric evidence concerning the impact of payroll taxes on aggregate investment.

A payroll tax may also distort economic decisions by altering employment contracts. If the payroll tax base does not include the earnings of the self-employed, then it may be profitable for firms to replace the labour of their employees with the labour services of "independent contractors" (who may well be the same people). The State of Victoria in Australia has implemented measures "to counter 'accel-

erated erosion of the payroll tax base' which was seen to have arisen 'through the increased propensity of employers to engage new staff as contractors rather than as employees, and to convert existing employees to contractor status.' '[36] Since the employer-employee relationship presumably exists because some economic advantages are obtained through long-term and stable contractual relations, anything that causes the firms to make less use of this relationship will impose a deadweight loss on the economy. The recent announcement that the EHT will be extended to the self-employed can therefore be justified on efficiency, as well as equity grounds, because it will reduce the incentive to substitute the labour of self-employed contractors for the labour of employees. There will still be an incentive to hire self-employed contractors instead of employees who earn less than $40,000 because the EHT will be levied only on self-employment income in excess of this threshold. Given the relatively low rate at which the EHT is currently applied, the cost saving may not be significant enough for many firms to alter their hiring practices. However, if the EHT rates are increased in the future, it may be necessary to collect the EHT on self-employment income below the $40,000 threshold.

A payroll tax may also alter the way in which employees are remunerated if fringe benefits are not included in the payroll tax base. For example, a high payroll tax rate applied to the wages of employees may induce firms to provide their employees with more conferences and training sessions in desirable locales. While there are similar incentives to engage in non-wage compensation under the personal income tax, the income tax base includes pensions that are not included in the EHT base. Thus, if the EHT is imposed at substantially higher rates, it may generate more pressure to use pensions and other forms of non-wage compensation.[37]

Finally, payroll taxes can distort the allocation of resources if the effective payroll tax rate varies across industries. In a study of the social-security tax in the United States in 1963, Deran (1967b) found that the average tax rate as a percentage of the value of output was 1.72 per cent, with a standard deviation of 0.53 per cent. She calculated the deadweight loss from the variation in the rate, using a formula devised by Arnold Harberger under the assumptions that (a) the tax-rate differentials were reflected in consumer prices, (b) the price elasticity of demand was unity for all industries and therefore the shares of income of industries were constant, and (c) there were no other distortions in the economy. She found that the deadweight

loss from the tax-rate variation was $612.4 million, or 9.4 per cent of social-security revenues, in 1963. The efficiency loss from variations in the payroll tax rate calculated by Deran is obviously significant, but the assumptions underlying the calculations are very strong. Relaxing these assumptions requires the use of a computable general equilibrium model. The only study that I am aware of that has used this technique to study the resource allocation effects of variation in payroll tax rates is by Whalley (1975). He analysed the 1973 tax reforms in the United Kingdom that, among other things, replaced the Selective Employment Tax (SET) and the purchase tax, a sales tax imposed mainly on consumer durables, with a value-added tax (VAT). The SET had been severely criticized because it effectively taxed services and subsidized manufacturing. (See Industrial Policy Group 1970 and Reddaway 1973.) Whalley found that the elimination of the SET and the purchase tax by the VAT resulted in a welfare loss because the industries with relatively high SET rates were also industries with relatively high capital tax rates, and therefore the SET helped to offset the distortion in factor markets caused by variations in capital taxation across industries (see Whalley 1975, table 3, 150). The Whalley study illustrated very graphically the potential importance of the distortions caused by other taxes in determining the efficiency effects of a payroll tax.

Another distortion that has attracted considerable professional attention in recent years is the distortion in savings decisions. The payroll tax, and wage taxes in general, do not distort savings decisions because they do not tax the return on capital. In this respect, they are like consumption taxes. The relationship between consumption and wage taxes is discussed in greater detail in the next section.

Interactions with Other Taxes

The efficiency and equity effects of a tax depend, in part, on how the tax interacts with the other taxes imposed by government. Three types of interactions can be considered. First, two tax bases may be equivalent, as far as their economic impact on a household is concerned, and therefore an increase in one tax merely adds to the total tax impact. Second, variations in one tax rate may affect the magnitude of another tax base. This means that an increase in one tax rate may increase or (more typically) reduce the taxes collected from another tax. The third type of interaction occurs when the revenue collected

from one tax is deducted in the computation of the corporate income tax and the personal income tax. Each of these types of interactions will be analysed in this section.

The Equivalence of Consumption Taxes and Wage Taxes

Under certain conditions, a tax on all wage income is equivalent to a broad consumption tax. The equivalence of these taxes is discussed in detail in Davies (1992), and therefore my treatment of this issue will be very brief. To demonstrate this equivalence, consider an individual's intertemporal budget constraint that indicates the pattern of consumption over the individual's lifetime that is feasible, given the individual's inheritance and bequests, and the time path of his or her labour income.[38] This budget constraint is given below under the assumption that wage income and inheritances are taxed at a constant rate, t:

$$\left(\sum_{i=1}^{N} \frac{w_i E_i}{(1+r)^{i-1}} + I\right)(1-t) = \sum_{i=1}^{N} \frac{C_i}{(1+r)^{-1}} + \frac{B}{(1+r)^N} \qquad (16)$$

where the individual is assumed to live for N years, w_iE_i is the labour income generated in year i, I is an inheritance assumed to be received in year one, C_i is the consumption in year i, B is the bequest made in year N, and r is the discount rate. Alternatively, if consumption and bequests are taxed at the rate τ, such that gross consumption expenditure in year i is $(1 + \tau)C_i$, then the individual's budget constraint would be:

$$\sum_{=1}^{N} \frac{w_i E_i}{(1+r)^{i-1}} + I = \left(\sum_{i=1}^{N} \frac{C_i}{(1+r)^{-1}} + \frac{B}{(1+r)^N}\right)(1+\tau) \qquad (17)$$

Consequently, if $(1 - t)^{-1}$ equals $(1 + \tau)$ or τ equals $t(1 - t)^{-1}$, then the individual will be able to enjoy the same consumption profile under either tax regime, given the same time paths for wage income, inheritances, and bequests. From the perspective of the individual, the wage and inheritance tax would be equivalent to the consumption and bequest tax.

Three points concerning this equivalence should be noted. First, the wage tax is *not* equivalent to a consumption tax if inheritances

and bequests are not taxed. The consumption tax base exceeds the base of the wage tax by the present value of the net intergenerational transfer, $I - B(1 + r)^{-N}$, received by an individual. Second, in the absence of inheritances and bequests, a wage tax would have a different time pattern for tax revenues than would an equivalent consumption tax. More of the tax revenue is collected at the end of the individual's life under the consumption tax because, in the typical situation, labour income is very low or non-existent during the last years of the individual's life. This implies that an individual would have to save more under the consumption tax in order to meet the larger future tax burden. Simulation models developed by Summers (1981) and Auerbach and Kotlikoff (1987) have demonstrated that a switch from an income tax to a consumption tax can have a larger stimulative effect on an economy's capital accumulation than a switch to a wage tax because of the larger increase in individual savings under the consumption tax. Third, there may be important differences in the collection and compliance costs associated with consumption and wage taxes.

Tax Base Interactions

Changes in payroll tax rates will, in general, have important effects on the revenues collected from other taxes. For example, an increase in an employer payroll tax will tend to reduce personal income tax collections because it will reduce the wage bill unless the demand for labour is completely inelastic.[39] Similarly, a payroll tax increase will tend to reduce sales tax revenues in so far as it reduces disposable income. Finally, a payroll tax may reduce corporate tax revenues if the total supply of labour to the economy is not completely inelastic and if the corporate sector is labour intensive. That is, under these conditions the payroll tax will increase the relative price of the corporate sector's output and reduce its output relative to that of the non-corporate sector.[40]

Deductibility

Payroll taxes can also affect other tax revenues if they are treated as a deduction under the personal income tax or the corporate income tax. For example, an employee's UI and CPP contributions are deductible under the federal and provincial income tax. The employer's UI and CPP contributions are deductible under the federal and pro-

vincial corporate income tax. The employer's EHT payments are deductible under the Ontario corporate income tax, but it was announced in the 1991 Federal Budget that limitations would be placed on the deductibility of provincial payroll and capital taxes under the federal corporate income tax.

I will first discuss the case for allowing the EHT to be deductible under the Ontario corporate income tax and then examine the implications of the non-deductibility of the EHT under the federal corporate income tax.

There is a strong efficiency argument for allowing the EHT to be deductible under the provincial corporate income tax if the corporate income tax is non-distortionary.[41] In the absence of deductibility, the corporate income tax would exacerbate the tax wedge created by the payroll tax such that it would equal $t(1 - u)^{-1}$. This larger tax wedge would reduce the amount of employment in the corporate sector and increase the deadweight loss from taxation. To the extent that the corporate income tax is distortionary, the efficiency argument for deductibility is weaker because, in the absence of deductibility, the corporate tax rate could be lowered to collect the same revenues. Lowering the corporate tax rate might increase investment, and this could also lead to increased employment if the output effect of the corporate tax rate reduction outweighed the substitution effect. Consequently, there might be an efficiency gain from switching to a non-deductible payroll tax if the corporate income tax is distortionary. However, any efficiency gains that might accrue from non-deductibility could be obtained in a more straightforward manner with deductibility by raising the payroll tax rate and lowering the corporate tax rate.

In the 1991 Federal Budget, it was announced that the deduction of provincial capital and payroll taxes in calculating the federal corporate income tax would be limited to $10,000 per firm. Consequently, most small firms will still be able to deduct their EHT payments, but large firms will not be able to deduct them.[42] The federal government argued that the limitation was necessary because deductibility has biased the choice of provincial taxes in favour of those taxes that are deductible under the federal corporate income tax because some of the cost of the provincial tax increases are borne by the federal government.[43]

A measure of the bias in the choice of taxes caused by deductibility can be obtained by computing the difference between the MCPF from a payroll tax increase as perceived by the province and the actual

MCPF. This difference arises because the province will not take into account the reduction in federal tax revenues when it raises a payroll tax rate, whereas the actual MCPF measures the cost of raising an additional dollar of net revenue, whether it accrues to the federal or the provincial government. In other words, when a province calculates the MCPF using the formula in equation 14, the ΔR that it uses is the change in provincial revenues not the change in total federal and provincial revenues. Since federal corporate income tax revenues go down when the provincial government raises the payroll tax rate, the MCPF perceived by the province will be less than the actual MCPF and a province will tend to underestimate the social cost of using payroll taxes to raise revenues. This will lead to overreliance on payroll taxes by provincial governments. (The same arguments would explain a provincial bias in favour of capital taxes.) Based on the 1987 labour tax rates used by Thirsk and Moore and assuming a labour supply elasticity of 0.10, the perceived MCPF for a payroll tax rate by a province was approximately 1.050, whereas the actual MCPF was 1.073.[44] Thus deductibility does bias a province's MCPF, but the magnitude of the bias appears to be rather small.

If a provincial payroll tax is not deductible under the federal corporate income tax, then the effective payroll tax rate becomes $t(1 - u_p)(1 - u_p - u_f)^{-1}$ where u_p is the provincial CIT rate and u_f is the federal CIT rate. Thus, non-deductibility raises the effective tax rate by approximately 50 per cent. This increase in the effective tax rate increases the perceived MCPF from payroll tax, which counteracts the bias introduced by non-deductibility. With non-deductibility, a province's perceived MCPF for a payroll tax would increase to 1.074. My calculations of the MCPF, which are admittedly somewhat rough, indicate that the non-deductibility would remove any bias in favour of the use of payroll taxes by the provinces.

Before endorsing the federal government's policy, two other points should be mentioned. First, the federal proposal will still allow deductibility by most small businesses, and this may provide some bias in favour of payroll or capital taxes. Second, the argument that deductibility leads to biased choices in levying taxes applies to other taxes. These include taxes on commercial and industrial property (imposed by the municipal governments and deductible under federal and provincial corporate income taxes), and payroll taxes (levied by the federal government to finance unemployment insurance and the Canada Pension Plan and deductible under provincial personal and

corporate income taxes). Levelling the playing field may require the non-deductibility of all taxes imposed by federal, provincial, and municipal governments.

The Treatment of Small Business

The impact of payroll taxes on small business deserves special attention because employment growth over the past decade has been concentrated among small businesses. Also, payroll taxes on small business can affect the degree of progressivity in the distribution of the tax burden if a substantial part of the employer payroll tax is ultimately shifted to labour because small businesses pay lower wage rates. These issues, as well as the consequences of providing special treatment for small businesses, are discussed below.

The Characteristics of Small Firms

Table 16 indicates that the share of employment in firms with fewer than 5 employees increased from 5.74 per cent in 1979 to 14.02 in 1989, while the share of employment in firms with more than 500 employees declined from 54.71 per cent to 43.20 per cent. Just over 36 per cent of the total increase in employment over this period occurred in firms with fewer than 5 employees, while about 70 per cent of the increase in employment occurred in firms with fewer than 50 employees. In a study of trends in employment and firm size, Wannell (1992) found that the median number of employees declined by 40 per cent between 1978 and 1988. He concluded that "64% of the change in the company size distribution was due to with-in industry shifts [in the size of firms], 33% was due to among-industry differences in growth rates and 3% fell into the interaction term" (4.14–4.15). Thus, the growing importance of small firms in the creation of new employment is not attributable simply to the growing importance of the service sector where firms tend to be smaller. The trend towards smaller firms affects most goods-producing industries as well.

If small firms are the engines of employment growth, then payroll taxation may have an important impact on employment growth because payroll taxes, along with property taxes, are the most important tax paid by small firms. Table 17, which is based on an analysis of taxation and small business by Cléroux (1990), indicates that payroll taxes represent 37 per cent of the burden on a firm with less than $1

TABLE 16
Percentage Distribution of Employment in Ontario by Size of Firm

Size of business in annual labour units	Percentage of employment in 1979	Percentage of employment in 1989	Percentage of the net change in employment, 1979–89
fewer than 5	5.74	14.02	36.46
5–19.9	10.10	13.32	22.03
20–49.9	8.20	9.25	12.08
50–99.9	6.29	6.39	6.69
100–499.9	14.96	13.81	10.70
more than 500	54.71	43.20	12.04

Source: Statistics Canada, *Ontario Employment Dynamics: Business Size and Life Status, 1979–1989*, vol. 2, part 2

million in assets, whereas they account for only 28 per cent of the taxes paid by a firm with over $10 million in assets. One might attribute the greater relative importance of payroll taxes on small firms to the reduced rate of corporate income tax imposed on them. However, Cléroux (1991, figures 1 and 4) has found also that payroll taxes as a percentage of revenue, and, as a percentage of taxable income, are higher for small firms than for large firms. He attributed the larger burden that payroll taxes place on small firms to the greater labour intensity of small firms. His analysis indicated that the percentage of total expenses attributed to wages and salaries was larger for a small firm than for a large firm in each of the 15 manufacturing industries that he examined. Labour's share of total cost differed between large and small firms by an average of 10.4 percentage points, with a standard deviation of 7.3.[45] The greater labour intensity of small firms implies that an *ad valorem* payroll tax, which is not completely borne by labour, will raise the costs for a small firm by a larger percentage than it will those for a large firm.

There are other features of small businesses, in addition to their greater labour intensity, that may cause payroll taxes to have a special impact on small firms. Morissette (1991, 5) has analysed data from the 1986 Labour Market Activity Survey to study the implications of firm size on labour market activity and has concluded that "jobs in larger firms: 1) are more likely to be unionized, 2) are more likely to be covered by a pension plan, 3) are less likely to be terminated by a lay-off, and 4) receive a higher hourly wage." The study also concluded that "the probability of working in a large firm: 1) generally increases with education, 2) does not always increase with age for

TABLE 17
The Percentage Composition of Taxes by Size of Firm in Ontario, 1990

	Small Firm (%)	Medium Firm (%)	Large Firm (%)
Payroll taxes	37	32	28
Local taxes	35	32	30
Income and capital taxes	11	19	24
Consumption taxes	16	16	18

Source: Calculations by the author, based on Cléroux (1990, figure 1, p. 6)
Note: The columns may not sum to 100 because of rounding. A small firm is defined as a firm with less than $1 million in assets. A medium firm is defined as a firm with assets between $1 million and $10 million. A large firm is defined as a firm with assets exceeding $10 million.

women, 3) increases with age for men and 4) is, for male workers who are at least 35 years old or married, generally higher than for females."[46]

The Wage-Rate Differential between Large and Small Firms

The wage-rate differential between large and small firms will be examined in greater detail below because it may have important implications for the equity of the payroll tax. Morissette found that the average hourly wage in full-time jobs was 53 per cent higher in large firms than in small firms. Since the analysis had revealed that there were significant differences in the characteristics of workers hired by large and small firms, Morissette attempted to measure the differences in wage rates attributable to the size of the firm and independent of the characteristics of its employees. Morissette found that the wage-rate differential between large and small firms was reduced from 53 per cent to between 21 to 28 per cent when the observable characteristics of employees, such as education, age, tenure, sex, marital status, and union status, as well as occupation and industry, were held constant. A significant, though smaller, wage-rate differential existed among unionized workers (11 to 17 per cent). Among individuals who changed jobs, firm size resulted in a 7 to 9 per cent wage differential. To conclude, Morissette's exhaustive study indicated that (a) large firms hire more expensive labour, and (b) the wage rate for workers with the same observable characteristics is higher in larger firms.

Morissette (1991, 11–12) examined a number of hypotheses that might explain the firm-size effect on wages and concluded that an

efficiency wage explanation may be the most cogent. That is, large firms pay higher wage rates because they either have higher monitoring costs, higher training costs, or a greater need to maintain high morale among employees. Therefore; according to the efficiency wage model, large firms pay higher wages to increase productivity and/or reduce costs. An alternative explanation that is not considered in any detail by Morissette is that smaller firms may offer employees various intangible benefits that compensate for a lower wage rate. That is, workers may prefer smaller firms because they are more flexible, offer a greater range of work activities, permit greater personal contact among employees, and so on. The wage-rate differential could therefore be a compensating differential, reflecting the preferences of workers for small-scale organizations. Whether the wage rate differential is an efficiency-enhancing supplement or a compensating differential has important implications for tax policy. If it is efficiency based, then workers with lower wages in smaller firms are less well off than workers with higher wages in larger firms, and lower payroll taxes on small firms may be justified on equity grounds. However, if the wage-rate differential is a compensating differential, then low-wage workers in small firms are as well off as high-wage workers in large firms. Lower taxation of small firms would not be justified on equity grounds. In fact, it could be argued that small firms should pay higher payroll taxes to offset the distortionary effects introduced by a progressive personal income tax that would tend to induce workers to join the low-wage small firms. Obviously, more research on the source of the wage differential between large and small firms would be very valuable.

The Marginal Tax Rate Under the EHT

As previously noted, Ontario provides special tax treatment for small firms by imposing a lower EHT rate on them. In Manitoba, payrolls of less than $600,000 are exempt, and reduced tax rates apply to payrolls of less than $1.2 million. Newfoundland exempts payrolls of less than $300,000. The implications of reduced rates and exemption levels are discussed below.

As table 3 indicated, the EHT is imposed at a rate of 0.98 per cent if a firm's total remuneration is less than $200,000 per year. The tax rate then increases by about 0.12 percentage points for each additional $30,000 of total remuneration until the maximum rate of 1.95 per cent is reached (when a firm's total remuneration exceeds $400,000

per year). Thus, in 1990, almost 85 per cent of employers were taxed at half of the maximum rate, and the average rate was reduced for an additional 6.8 per cent of employers with total remuneration between $200,000 and $400,000.

While the EHT tax rate structure may impose lower average tax rates on small firms, it can also impose *higher* marginal tax rates on them, where the marginal EHT rate is defined as the additional EHT that a firm would have to pay in hiring an additional unit of labour. The reason why a firm's marginal tax rate may exceed its average tax rate is that if a firm in the $200,000–$400,000 remuneration range expands its employment, it may also face a higher tax rate. Thus, the additional EHT is the tax on the remuneration of the additional employee plus the additional EHT paid on the remuneration of the existing employees because the firm has moved into a higher EHT rate bracket.

Table 18 illustrates how the EHT tax rate structure can lead to a marginal EHT rate for small business that is substantially higher than for a large business. In this example, each employee is paid $30,000. The average EHT per employee for a firm with five employees is $294 ($1470/5), and the additional EHT from hiring an additional employee is also $294 ($1764 – $1470). If the firm has six employees and its total remuneration is $180,000, the average EHT is still $294, but its marginal EHT is now $548 because hiring an additional worker moves it into the higher tax rate bracket. Note that for firms with total remuneration between $210,000 and $390,000, the marginal EHT is higher than that faced by firms with total remuneration exceeding $400,000. Thus, the EHT rate structure lowers the competitive advantage of these firms *vis-à-vis* large firms by making it more costly for them to hire labour. Since the decision to expand employment involves a comparison of the extra revenue that an additional employee can generate versus the additional cost of hiring that employee, the EHT rate structure tends to discourage the expansion of employment by firms in the range of the increasing EHT rates.[47]

While the disincentive effect might be viewed by some as relatively minor, two points should be borne in mind. First, with continued inflation, it is likely that an increasing number of firms will find themselves facing the high marginal EHT rates unless the remuneration thresholds are also increased. Second, if the decision is made to collect substantially more revenue through the EHT by raising the standard rate, but keeping the lowest rate constant, then the problem of high marginal EHT rates will be exacerbated because it varies directly with the change in the tax rate.

TABLE 18
A Calculation of the Average and Marginal EHT by Size of Firm

Number of employees	Remuneration per employee	Total remuneration	Total EHT	Average EHT per employee	Additional EHT from hiring an additional employee
5	30,000	150,000	1,470	294	294
6	30,000	180,000	1,764	294	548
7	30,000	210,000	2,312	330	623
8	30,000	240,000	2,935	367	694
9	30,000	270,000	3,629	403	766
10	30,000	300,000	4,395	440	839
11	30,000	330,000	5,234	476	915
12	30,000	360,000	6,149	512	984
13	30,000	390,000	7,133	549	1,057
14	30,000	420,000	8,190	585	585
15	30,000	450,000	8,775	585	585

Source: Calculations by the author

Alternative Mechanisms for Providing Payroll Tax Reductions to Small Business

Given the problem created by the current EHT rate structure, it is worthwhile to consider some alternatives. First, the EHT could be imposed at a single rate, as in Quebec, with no tax reduction for small business. If the EHT had been imposed in 1990 at the lowest rate, 0.98 per cent, and if this change had no effect on total remuneration, then the total EHT revenue would have been reduced by 46.6 per cent, from $2.433 billion to $1.297 billion. It is unlikely that the Government of Ontario would favour such a revenue reduction, given its current budget deficit. It would also be very unpopular with the small-business sector because almost all of the tax cut would accrue to large firms. Alternatively, if the EHT had been imposed at the maximum rate of 1.95 per cent on all employers in 1990, and again assuming that this would have had no effect on remuneration, then total EHT revenue would have increased by only 6.14 per cent, from $2.433 billion to $2.582 billion. Such a reform would also be politically maladroit because the relatively modest revenue increase would be achieved at the expense of the small firms, who would see their EHT liability double. Thus, it will be very difficult for any government to move to a single rate structure for the EHT.

An alternative way of providing payroll tax relief to small business would be to impose a single rate, t, with an exemption for total remuneration below some threshold, T. The formula for calculating the EHT liability of a firm with total remuneration, wE, would be $t(wE - T)$ if $wE \geq T$ or 0 if $wE < T$. Such a mechanism means that the marginal payroll tax rate is either zero, for firms with remuneration below T, or t for all firms with total remuneration exceeding T. Thus, the problem of smaller firms facing higher marginal EHT rates than larger firms would be avoided.[48]

If this tax structure had been imposed in 1990 with an exemption level of $400,000, then 90.96 per cent of employers, representing 13.91 per cent of total remuneration, would not have paid the tax, but revenues would have declined by 19.03 per cent. An increase in the EHT rate from 1.95 to 2.41 per cent would have been required to generate the same revenues in 1990 with a $400,000 exemption. Thus, a revenue-neutral tax reform – which would remove the high marginal EHT rate from the approximately 7 per cent of employers with total remuneration between $200,000 and $400,000 per year, and which would lower the average tax rate for all firms with less than $2.1 million per year in total remuneration – would require a 0.5-percentage-point increase in the marginal tax rate for the 9 per cent of employers with total remuneration exceeding $400,000 who account for 86 per cent of total remuneration. Thus, it is by no means clear that a revenue-neutral switch to an exemption system would reduce the potentially detrimental effects of the EHT on employment.

However, there may be an advantage in imposing a flat tax rate on remuneration in excess of an exemption level because it might lead to some reduction in administration and compliance costs. The magnitude of these savings is difficult to judge because it may still be necessary to have all firms file an annual payroll tax form, whether or not they had to pay EHT. Still, it is reasonable to assume that there would have been some administration and collection cost savings in 1990 from introducing an exemption level of $400,000 and reducing the number of tax-paying firms from 359,287 to 32,444.

One of the problems with providing a payroll tax reduction to small businesses is it creates an incentive for firms to carry on their activities as a series of small firms instead of merging to take advantage of such economies of scale or scope as exist. This disincentive is modest at current EHT rates, but would become a more serious problem if the EHT rates were significantly increased to obtain more revenue.

In conclusion, I believe that if payroll tax relief is to be provided

to small business, it is preferable to provide it in the form of an exemption with a single tax rate rather than maintain the current system in which all employers, no matter how small, are liable for the tax, and the tax rate increases as the firm's total remuneration increases.

Other Issues

Earmarking

The earmarking of tax revenues has been defined as "the designation of funds – either from a single tax base or from a wider pool of revenues – to a particular end-use."[49] Although Bill 47 is entitled "An Act to impose a Tax on Employers for the purpose of providing for Health Care ...," the EHT should not be considered an earmarked tax because the revenues from the EHT are not placed in a special fund, and health-care expenditures are not functionally related to the amount of revenue raised from the EHT. The name "Employer Health Tax" indicates only that the EHT was substituted for the OHIP premiums. While the EHT is not an earmarked tax, it could be converted into one tax by legislating that a fixed percentage of health-care costs be funded by the EHT.

Most public-finance economists have been opposed to using earmarking as a budgeting tool (see, for example, Deran [1965] and Goode [1984]). The fundamental argument against earmarking is that it introduces an artificial constraint into the budgeting process. These imbalances in the allocation of taxation and expenditures under earmarking may become especially large if earmarking is not reviewed for long periods of time. Other public-choice economists, including Buchanan (1963) and Browning (1975), support earmarking because, in their view, the "self-seeking of politicians and bureaucrats and the imprecision of democratic elections ... often make earmarking a more, not less, efficient method of resource allocation than general fund financing."[50] The advantage of earmarking is that it encourages the comparison of the cost of imposing one tax with the benefits from the earmarked expenditure program.

If one views the conventional budgeting process as completely inefficient, then any alternative, including earmarking, would likely be an improvement. However, the onus is on the proponents of earmarking to demonstrate that general-fund financing is indeed hopelessly flawed and that earmarking would be better. In the absence of

any solid evidence to this effect, I believe that it is prudent to continue with general-fund financing and eschew the siren calls of the public-choice economists.

If it is agreed that the EHT is not an earmarked tax and that earmarking is not advisable, should a more accurate title, such as "Employer Payroll Tax," be used to denote this tax? Some may argue that the current title serves a useful purpose in reminding the general public that the taxes are necessary to finance the programs, such as health-care services, that they value. The problem is that the current name does not serve the purpose of highlighting the link between taxation and government services very well because of the widespread view that this payroll tax is borne by employers. If the principle of "truth in advertising" is to be applied to the public sector as well as the private sector, then the name of the tax should be amended to remove any connection with health care expenditures.

Taxation of Public-Sector Employment

Bill 47, which enacted the EHT, defines an employer as "a person or government, *including the government of a province, a territory or Canada*, who pays remuneration to an employee" (emphasis added). In 1990, $265 million, or approximately 10 per cent of EHT revenues, came from public-sector employers, with $123 million collected from the federal government; $69 million collected from the Ontario government; $38 million collected from Ontario Hydro; and the remaining $35 million collected from municipalities, universities, schools, and hospitals (the MUSH sector).[51] In this section of the paper, I examine some of the special issues that arise from a payroll tax on public-sector employers.

The EHT levied on federal government employment represents about 5 per cent of the total revenue collected. The federal government's relatively large share of the EHT is attributable in part to its relatively large presence in Ontario. While Ontario had about 36.5 per cent of the population in 1990, it accounted for approximately 38.2 per cent of employment and 39.0 per cent of remuneration by the federal government.[52]

Imposing the EHT on the federal government raises some interesting constitutional issues because, under the Canadian Constitution, the federal and provincial governments are immune from taxation by other governments (see LaForest [1967] and Moull [1984]). Section 125 provides that no "Lands or Property belonging to Canada or any

Province shall be liable to Taxation." It is the federal government's view that it is not legally obligated to pay provincial payroll taxes and that its payment of the EHT, and other provincial payroll taxes, is "voluntary." The validity of the federal government's position might be questioned because it is difficult to see how a tax on the federal government's remuneration of its employees could be conceived of as a tax on its "Lands or Property." However, the subtle legal nuances of this issue are beyond my expertise, and the question of whether the federal government is legally bound to pay the EHT may ultimately be subject to judicial review.[53]

If the Supreme Court ruled that the federal government was not obliged to pay the EHT, then it is likely that the provincial governments would not be required to pay the contributions for unemployment insurance or the Canada Pension Plan of the employers. However, provincial governments would probably continue to make their contributions so that their employees would be eligible for the benefits under these programs. A similar incentive would not apply to the federal government because an individual's entitlement to benefits under the province's health-care program is not contingent on his or her employer paying the EHT.

Another issue regarding provincial payroll taxes on federal employment is the possibility that the tax will be borne by Canadian taxpayers at large, and therefore a significant portion of a provincial payroll tax burden may be shifted to non-residents. This possibility arises because the provincial payroll tax is probably not shifted back to the federal government's employees through a reduction in the pay of the employees. In order for the EHT to be shifted backward, federal civil servants would have to be paid different salaries in each province, depending on the provincial payroll tax rate. Since federal civil-service salaries are largely independent of the location of the employee and do not depend on the payroll tax rate in the province where they work, an increase in a provincial payroll tax will be mainly borne by taxpayers throughout the country.

While there is a strong possibility that the provincial payroll taxes on federal employment are "exported," it does not follow that this creates a bias that is large enough to cause a province, such as Ontario, to raise its payroll tax rates beyond the level that would have been set if the federal government were immune from provincial payroll taxes. If the Government of Ontario takes into account the additional taxes that the federal government has to impose in order to pay the EHT, then only about 3 per cent of the EHT could be exported to

taxpayers in other provinces through the taxation of federal government employment because Ontario pays about 40 per cent of federal government taxes. Consequently, the incentive to increase the EHT in order to tax the federal government is relatively small for Ontario, and it would probably not influence the decisions regarding the choice of the EHT rate.

There are also some interesting issues that arise from levying the EHT on the province's MUSH sector. A number of studies have indicated that local government employment is sensitive to the wage paid to employees (see, for example, Ashenfelter and Ehrenberg 1975). Thus, the EHT will tend to reduce the employment in the MUSH sector in Ontario unless these institutions are compensated for the increase in their costs. If the grants to these organizations are increased in order to compensate them for the imposition of the EHT, then the province's revenues and expenditures may have increased as a result of imposing the EHT on the MUSH sector with perhaps little real change in public-sector activity.

Should the EHT be imposed on employment by the provincial government and the MUSH sector? One might argue that it should not be imposed because the government is really just imposing a tax on itself. This increases both its revenues and its expenditures, distorting, to some extent, the financial statistics for the province.

An alternative view is that imposing the EHT on itself is necessary to provide decision makers with the appropriate signal concerning the cost of labour. The theory of cost-benefit analysis holds that decision makers in the public sector should base their employment decisions on the social opportunity cost of labour. The prevailing wage rate may differ from the social opportunity cost of labour as a result of distortions created by taxes or unemployment. The social opportunity cost of labour can be calculated as a weighted average of the demand price for labour and the supply price of labour where the demand price is the cost of labour to the employer, $(1 + t)w$ and the supply price of labour is the opportunity cost of time for workers, $(1 - \tau)w$.[54] The weights on these components will depend on the relative sizes of the elasticities of demand and supply for labour. Since the demand price for labour includes the employer payroll tax, the public sector should take this tax into account when it calculates the social opportunity cost of labour. If the elasticity of the supply of labour is very low relative to the demand for labour, then the social opportunity cost of labour will be approximately equal to the demand price of labour.

If employment decisions in the MUSH sector are made at arm's length from the provincial government and are based on the cost of hiring an additional unit of labour and not the social opportunity cost, then imposing the EHT on the MUSH sector will make its decision more consistent with those based on the social opportunity cost of labour if the social opportunity cost of labour exceeds $(w + {}^1/_2 t)$. If the social opportunity cost of labour is below this figure, then it would be better to omit the EHT from the MUSH sector so that the cost of labour to that sector is closer to the social opportunity cost of labour. Given that the current EHT rate is only 1.95 per cent, this implies that the social opportunity cost of labour would have to be within 1 per cent of the demand price for the levying of the EHT on public-sector employers to achieve an improvement in resource allocation. Since it is likely that the gap between the demand price of labour and the social opportunity cost of labour may be greater than 1 per cent, it may be advisable not to levy the EHT on the MUSH sector.

Payroll Taxes or Sales Taxes?

In this section, I consider some reasons why a sales tax may be preferred to a payroll tax. The sales tax is compared with the payroll tax because the earlier analysis showed that the bases of these two taxes may be similar when viewed from the perspective of an individual's lifetime. In addition, Whalley and Fretz (1990) have suggested that a payroll tax might be preferable to a sales tax, and this provides another reason for making a sales tax–payroll tax comparison. This comparison of the taxes is not definitive. It has been included in order to point out a number of efficiency and equity arguments that appear to favour a sales tax. These arguments need greater elaboration before a final judgement can be made concerning the relative merit of the two taxes. Other taxes, such as the personal income tax or the corporate income tax, are not evaluated because doing so would require an examination of a number of complex issues connected with the taxation of capital incomes that is prohibited by the limitations of space and time imposed by this paper.

Equity Arguments

Predictions from theoretical models and the evidence from econometric studies suggest that at least 80 per cent of an employer payroll tax burden is ultimately borne by labour through either reductions

in the real wage rate or increased unemployment. Most economists would also expect that sales taxes are ultimately borne by consumers. Thus, on a lifetime basis, the incidence of a sales tax or an equal-yield wage tax may be very similar. This should not be surprising in view of the similarity between the base of a consumption tax and the base for a wage tax. As was noted in an earlier section of this paper, the consumption tax base exceeds the wage tax base by the net intergenerational transfer that an individual receives. In the absence of taxation of inheritances and bequests, there is an equity argument for taxing at a higher rate those individuals who consume more and transfer less to future generations. That is, between two individuals who have the same lifetime wage income (in present-value terms) and receive the same inheritance, the individual who consumes more should be taxed at a higher rate. According to this view of economic justice, consumption is a more equitable tax base than wages.

The preceding argument was based on a long-term, or lifetime, perspective. The choice of a sales tax versus a payroll tax also has important implications for the fairness of the tax system in the "short term" because the switch from wages to consumption will have different effects on different age groups. In particular, sales taxes impose more of their burden in the latter stages of an individual's life, whereas payroll taxes are borne earlier, during the individual's working life. Thus, a switch from a payroll tax to a sales tax would tend to benefit the young at the expense of the old. Two points should be made concerning the short-term or transitional impact of a switch from a payroll tax to a sales tax. First, the use of a refundable sales tax credit can ameliorate the worst effects of the switch to a sales tax. While this mechanism cannot be expected to eliminate all of the inequities of a switch to a sales tax, because of the large differences in consumption among individuals of the same age and income, it does provide a mechanism to eliminate the worst problems. The second point is that there are many elderly individuals who are in a very favourable financial position *vis-à-vis* younger individuals of working age. The well-to-do elderly who benefit from health-care programs and other provincial government programs could be expected to contribute more towards the cost of these programs and to reducing the provincial government's deficit. The well-to-do elderly benefited from the relatively rapid economic growth of the 1970s and 1980s. The reduced prospects for economic growth over the coming decades suggest that an intergenerational-equity argument can be made for taxing the well-to-do elderly at higher rates than large sections of the current working-age population.

Efficiency Arguments

The similarity of the consumption tax base and the wage tax base for an individual on a lifetime basis might lead one to presume that consumption taxes and wage taxes would have the same efficiency effects. That is, one might expect the MCPF for a sales tax to be very similar to the MCPF from a payroll tax. However, some of the econometric evidence that was reviewed above suggested that employer payroll taxes may have greater effects on employment and unemployment than sales taxes or personal income taxes. More research is required before one could state with a great deal of confidence that sales taxes have less harmful effects on employment and unemployment than do payroll taxes. Still, the available evidence should not be ignored in making decisions concerning the choice of tax bases.

Another difference between sales taxes and payroll taxes concerns their impact on the underground economy. High rates of personal income tax and payroll tax may cause some individuals to work in the underground economy where payments are made in cash, and payroll and income taxes are avoided. Sales taxes on the products produced in the underground economy may also be avoided. However, a revenue-neutral shift from a payroll tax to a sales tax may reduce the size of the underground economy because the value of the output of the "legitimate" sector of the economy (the sales tax base) is greater than the wage bill in the legitimate sector of the economy (the payroll tax base). Therefore, the sales tax rate increase will be less than the payroll tax rate reduction. As a consequence, workers in the legitimate sector of the economy will be made better off, and the real incomes of workers in the underground economy will be reduced because they will have to pay a higher price for the output of the legitimate sector. This will cause the underground sector to contract. A switch from direct taxes to indirect taxes has been advocated in Australia, Japan, New Zealand, and the United States, in part because of the potential for reducing the size of the underground economy.[55]

Similarly, efficiency and equity arguments can be made for imposing a sales tax instead of a payroll tax because of the problem of taxing the income of the self-employed. As previously noted, the EHT will be levied only on self-employment income in excess of $40,000. While this provision will make the EHT fairer and reduce the incentives to switch to self-employed contractors, it will still constitute an important source of unequal tax treatment on the basis of the source of labour income.

To conclude, it can be argued that sales taxes are preferred to payroll taxes on both efficiency and equity grounds. One's confidence in these arguments is tempered by the fact that very little research has been done on the economic impacts of payroll taxes, either in Canada or in other countries. However, before emulating the tax regimes in such countries as the United States that rely heavily on payroll taxes, Canadian governments should investigate the relative merits of the sales and payroll taxes and not merely adopt the tax structures imposed in other countries on the assumption that these countries have made the best choice.

Notes

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1 See *Government of Ontario, 1979*, Budget Paper D, 8.
2 See Bill 47, p. 2.
3 Information provided by the Employer Health Tax Branch, Ontario Ministry of Revenue
4 Government of Ontario, 1992, 81
5 See Morissette 1991, table 4.
6 Data provided by the Ministry of Treasury and Economics. Data on EHT contributions by the municipal and education sectors are not available.
7 Government of Ontario, 1992, table 3, p. 39

8 The premiums used to finance Workers' Compensation are more like user charges than payroll taxes because some attempt is made to relate the premiums to the expected cost of the insurance coverage from hiring different types of workers by different employers. The financing of the compensation of workers will be discussed briefly at the end of this section.

9 See Canadian Tax Foundation, 1992a, table 7.13, p. 7:20.

10 Perry 1989, 653

11 The Government of Quebec also levies a payroll tax of 0.125 per cent to cover the operating cost of the Labour Standards Commission and a payroll tax of 0.75 is applied to the construction industry "in respect of labour relations, vocational training, and manpower management" (Canadian Tax Foundation, 1992b, 10:26).

12 See also McKee, Vicker, and Saunders (1986) for an international comparison of payroll taxation.

13 See Dahlby 1992 for a discussion of some of the issues.

14 Ornstein 1992, 13.

15 See Central Statistical Office 1992, table 4. The average employers' share of social-security contribution in 1989 for the 11 countries listed in this table is 0.571, with a standard deviation of 0.151.

16 See Sumner 1981 and Sullivan 1985 for empirical studies of the extent to which excise taxes on cigarettes are shifted to consumers in the United States.

17 See Feldstein 1974, 553–60, and Kotlikoff and Summers 1987, 1050–54, for more detailed treatments of payroll tax incidence within this framework.

18 A negatively sloped or backward-bending labour supply curve is also possible. Stability of the equilibrium requires that the demand curve intersect the supply curve from below.

19 Whether the tax burden is shifted through a wage rate reduction or a price level increase is important for those who are not employed if government transfer payments are not fully indexed.

20 See Pisauro 1991 for a theoretical analysis of the effect of payroll taxes on unemployment in an efficiency wage model.

21 Some of the material in this section is based on Dahlby 1992.

22 An early study of payroll tax incidence by Deran (1967a) is not easy to categorize because it did not rely on regression techniques. Instead, Deran calculated the share of net income of employees in Puerto Rico before and after the U.S. social-security tax was collected on the island in 1951. She found that the employees' share increased and concluded that "it does not seem overwhelmingly rash to deduce that employers

and/or *rentiers* and lenders probably bore the primary burden of the tax" (p. 629).

23 See MacRae and MacRae 1976 for a discussion of the appropriate treatment of payroll taxes with ceilings on contributions.

24 This is my interpretation of the rationale for including the unemployment rate in the model. Their equation on page 155 indicates a greater weight on the wage claims of workers when the unemployment rate is high. I believe this is a typographical error.

25 See Oswald 1985 for a survey of models of trade-union behaviour.

26 See also Auld and Wilton 1988 for a study of the effect of taxation on Canadian wage contracts.

27 The tax rate variable in the wage rate regression equation was the "tax wedge" between the cost of a unit of labour to employers and the real net wage received by workers, and was measured as the sum of the employer payroll tax rate, the income tax rate, the indirect tax rate, and the relative increase in import prices.

28 The tax rate variable in the wage rate regression equation was the "tax wedge."

29 Although not strictly comparable because they were obtained from simulating a general-equilibrium model of the Canadian economy in 1980, it is interesting to note that Hamilton and Whalley (1989, 571) found that the MCPF was 1.16 for a provincial retail sales tax, 1.34 for the Manufacturer's Sales Tax, and 1.07 for a broadly based sales tax.

30 The MCPF is less than one when the supply curve of labour has a negative slope because employment increases when the payroll tax is increased. The MCPF is greater than one even though the supply of labour is completely inelastic because of the progressivity of the income tax system.

31 The main reason for the differences in the results is that the formula used by Thirsk and Moore (1991) is based on the assumption that an individual is fully compensated for any taxes which are imposed on him. Therefore, his level of well-being is assumed to correspond to a no-tax situation. The Mayshar (1991) formula is based on the assumption that the individual's well-being is at the post-tax level. Since the Mayshar formula is based on the actual level of well-being, and not a hypothetical level, it provides a better basis for measuring the impact of a tax increase on an individual.

32 For example, Bean, Layard, and Nickell (1986) found that changes in the tax wedge accounted for 28 per cent of the increase in unemployment in Finland. However, Blomqvist (1987, 690), who analysed unemployment in Finland over the period 1970 to 1982, using a model similar to that used by Holmlund (1983), has concluded that "the real

wage rate and payroll tax rate seem to be insignificant as determinants of the rate of unemployment."

33 The calculated MCPF was not sensitive to variations in the discount rate.

34 This comparison underestimates the effect that unemployment has on the calculated MCPF because the calculation did not include the effect of the progressivity of the income tax.

35 See Rushton 1992 for an extensive review of the empirical literature on investment.

36 Velten 1990, 79

37 Concern about the growth of non-wage compensation in the United States has been expressed by Munnell (1989). The Government of Australia has introduced a fringe tax that includes the employee benefits from automobiles, loans, expense payments, housing, airline travel, and entertainment. See Marks 1986 and Parmenter 1986.

38 My treatment of the equivalence of wage taxes and consumption taxes is based on Atkinson and Stiglitz 1980, 69–72.

39 Within the context of the demand and supply model, a one-percentage-point increase in a payroll tax will reduce the wage bill by approximately $\varepsilon(1 + \eta)(\eta - \varepsilon)^{-1}$ percentage points.

40 The corporate sector in Harberger's classic analysis (1962) of the incidence of the corporate income tax in the United States was labour intensive.

41 A corporate income tax would be non-distortionary if the tax were levied on a cash-flow basis.

42 Offsetting adjustments in the definitions of taxable income were also proposed to make the switch to "limited deductibility" revenue neutral.

43 The deductibility of state and local taxes in the United States has received considerable attention. See Gramlich 1985, Feenberg and Rosen 1986, Feldstein and Metcalf 1987, and Rosen 1988.

44 The computed MCPFs in this example are lower than those presented in table 15 because these do not account for the progressivity of the personal income tax.

45 See Cléroux 1991, table 2. The difference in labour intensity between small and medium firms was also evident in most industries, but the differences between medium and large firms was not significant.

46 Morissette 1991, 6. A small firm was defined as a firm with fewer than 20 employees. A large firm was one with more than 500 employees.

47 This problem also occurs under the tax rate schedule proposed for the EHT on self-employed earnings.

48 The Manitoba payroll tax combines an exemption level with a "notch

rate" payable by employers with total remuneration exceeding the exemption level. As previously noted, the Manitoba system implies that some firms face marginal payroll tax rates that are twice as high as those imposed on the largest firms.

49 Teja, p. 11, in Teja and Bracewell-Milnes 1991.

50 Teja and Bracewell-Milnes 1991, 50

51 Figures provided by the Ministry of Treasury and Economics, Government of Ontario

52 Canadian Tax Foundation 1992a, table p. 6.13, 6:20

53 One would sincerely hope that the federal government does not view its civil servants as its property.

54 See Boadway and Bruce 1984.

55 See Kesselman 1988 for references. Kesselman argues that the switch from direct taxes to indirect taxes would probably have a very small impact on the size of the underground economy. It should also be noted that, if there are distortionary taxes on capital in the legitimate sector of the economy, a reduction in a payroll tax may produce an efficiency loss such as Whalley (1975) observed when the VAT replaced the SET in the United Kingdom.

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4 The Impact of Taxes on Business Locations

ERNST & YOUNG

This study focuses on the potential impact of taxes on business-location decisions and the regional allocation of investment. It is noted at the outset that the impacts of taxes on corporate-migration decisions are only a part, and not necessarily the most important part, of the impact of taxes on total business investment. Actual corporate relocations are highly publicized but relatively infrequent events. Domestically based firms' investment decisions are also influenced by tax rates, and the aggregate impacts of these investment decisions are likely to be of greater importance than the impacts of firms that explicitly made a choice of a location in a given period. Literature on the overall impacts of taxes on investment decisions is extensive and is not reviewed here.[1]

Theoretical Overview

A large body of theoretical work has a bearing on some aspects of the relationship between taxes and business-location decisions. Since the focus of this study is on empirical work, it does not provide a full survey of this theoretical work. However, it is useful to begin with a brief review of some of the complexities that enter into the potential relationship, even at the theoretical level. The theoretical considerations suggest that there need not be a simple, negative relationship between taxes and businesses investment.

Several strands of research exist on the theory of investment and location decisions. At the local level, various models in economic geography and urban/regional economics pertain to how firms select

a location in a city or region. The emphasis in these models is on such factors as minimizing transportation costs to customers and suppliers, agglomeration economies, commuting distances and local labour markets, and zoning and land costs.

The role of taxes in these fairly localized investment decisions is complicated by the further relationship between taxes and publicly supplied infrastructure and services. Thus, similar to the analyses of individual residence-location decisions, businesses may "vote with their feet" in selecting communities that have their desired mix of taxes and business services. Higher taxes, if used to pay for superior business services (or worker education and so on), might not be a locational disadvantage for some firms. Furthermore, local property tax differences could, in theory, become capitalized in differences in land prices, and thereby not play a role in new investment decisions.

Many of the same complexities enter into decisions at the regional level. Differences in tax and spending policies not only can affect businesses directly, but also can have more complex general equilibrium impacts through tax shifting. The impact of regional taxes on capital income on investment in regional general-equilibrium models is dependent on factor-substitution elasticities and the interregional mobility of factors of production. From a regional economic welfare perspective, the role of taxes is further complicated by the possibilities for "tax exporting." Taxes in one region may be shifted to residents in a second region as a result of impacts on the terms of trade (relative prices of exports and imports) and through cross-regional ownership of factors of production.

At the national level, models deal with the determinants of total investment spending in a closed economy. Taxes enter into the "user cost of capital" in the neoclassical investment models developed by Jorgenson and others in the United States (see Hall and Jorgenson 1967) and subsequently applied to Canada (see Boadway and Kitchen 1984, for a review). Other approaches examine taxes from the perspective of portfolio behaviour and their impact on risk taking, and find that the impacts on risk taking are uncertain.

At the international level, a large body of literature exists on the factors that promote foreign direct investment (FDI) flows. In terms of aggregate FDI, the theory includes models relating to portfolio diversification as well as neoclassical models similar to those developed for investment spending in a closed economy.

At the micro-economic level, industrial-organization economists have developed a rich body of theory on the factors that underlie the

development of multinational corporations. In these models, firms are viewed as choosing among FDI, licensing, or direct export from facilities in the home country. Foreign investment is therefore promoted by trade and economic barriers to direct export, and advantages held by the multinational over firms in the host country (technological advantages, product differentiation, etc.). Taxes would play only a modest role in such models, primarily through their impact on costs, prices, and thus on local market demand. Other models stress product life-cycle theories, where firms initially produce in a high-cost country, and gradually shift production to lower-cost countries as the product becomes more standardized. Here, taxes and other cost considerations would become more important in the selection of an offshore production site.

All of the international models are further complicated by exchange-rate considerations. For example, Summers (1988) notes that tax cuts could reduce the competitiveness of existing enterprises in a country by attracting foreign-capital inflows that push up the exchange value of the local currency. (In the long run, further potential exchange-rate adjustments would occur as a result of the impact of capital inflows on long-run exports and outflows of dividends.) Summers argues that the observed lack of international mobility of capital (specifically, the high correlation between domestic savings rates and domestic investment rates) suggests that countries adjust tax, fiscal, and monetary policies to avoid large capital inflows and outflows. The suggestion is, therefore, that tax rates and foreign investment flows might be linked in a complex, bidirectional relationship that would again complicate empirical work.

Exchange rates also work to cancel out some of the impacts of taxes on "competitiveness." A tax policy that increases costs to a broad range of Canadian industries would lead to a decline in exports and, in the long run, a decline in the exchange value of the dollar, which in turn would help restore business competitiveness.

Furthermore, foreign government tax policies on multinational enterprises introduce complexities in the impact of Canadian and Ontario business taxes on the corporation as a whole. Damus, Hobson, and Thirsk (1991) argue that the existence of foreign tax credits may make it appropriate in the Canadian case to think of investment spending as responding to the gross (pre-tax) rental flows as opposed to the net (after–Canadian tax) flows. However, more recent work by Leechor and Mintz (1990) – among others – shows that where the capital-exporting country allows for deferral of home-country taxes

where companies reinvest profits (as is the case in the United States, the United Kingdom, and Japan), both home- and host-country taxes become relevant for foreign-investment decisions. The formula for determining total home- and host-country tax burden on a foreign investment is actually quite complex, and not well related to the formulations applied in empirical work. Bruce (1989) discusses these issues in the context of tax reform in Canada and the United States.

In summary, then, the theoretical literature does not suggest a simple, unidirectional relationship from taxes to business investment in a jurisdiction at the local, regional, or national level. Taxes and investment are likely to be jointly endogenous, and taxes affect investment not only directly, but indirectly through tax impacts on portfolio behaviour, labour migration, savings, and the supply of public goods. All of these complexities pose hazards for empirical studies, which tend to employ single-equation methods, using a small number of variables.

Scope and Organization of This Study

Since the literature specifically relating to Ontario is very slim, our study draws upon evidence from studies across North America on the degree to which business location is affected by tax considerations. As noted above, our focus is largely on empirical investigations, rather than on the theory of industrial location. Furthermore, the extensive literature dealing with the linkages between aggregate investment spending and taxes, but not focused on interjurisdictional issues, did not fit the terms of reference for this study and, thus, is not discussed here.

The literature on taxes and business-location decisions can be subdivided into four types of studies:

1. anecdotal evidence, often relating to the motives behind individual location decisions;
2. surveys of business executives on the factors that influenced them in choosing a location;
3. econometric analyses of the determinants of investment locations or relocations; and
4. econometric analyses on the linkages between taxes and other factors that are considered in investment location decisions.

Each of the four types of literature noted is discussed below, and the

final section of this study outlines recommendations for further research in this area.

The report draws on literature from Canada, as well as on the much more extensive group of studies pertaining to U.S. firms. While tax policies in the two countries differ, it is believed that the evidence on the factors that motivate firms in choosing a location within the United States would be broadly similar to those considered by a firm looking at Ontario, particularly since Ontario competes for investment with U.S. jurisdictions.

Anecdotal Evidence

Taxes are often given an important, although not dominant role in discussions in the business press of reasons for companies deciding to move. A survey of articles on company relocations or closures in the past two years reveals several mentions of high taxes as a reason why businesses have shut down or moved. Overall, however, labour costs are usually given a more prominent role, and taxes tend to be only one among several factors listed.

Business Week (Symonds 1991) cited "high labour costs and taxes" as a reason why 85 Canadian companies have set up shop in Buffalo since 1987. Similarly, *Canadian Business* (Allaby 1990) mentioned "lower production costs, land grants and tax breaks" as lying behind the pull-back of U.S. branch plants from Canada.

Royal Bank economists (*Globe and Mail* 1991) linked the loss of Canadian manufacturing jobs to high labour costs, taxes, and interest rates, and the high Canadian dollar.

Writing in *Management International Review*, Rugman and Tilley (1987) listed four "pull" factors motivating net Canadian direct investment in the United States in the 1970s and early 1980s: the size and growth of the U.S. market; the need to overcome barriers to direct export; investment incentives; and perceptions of lower political risk, greater productivity, and cheaper factor costs. Three "push" factors to investment abroad are listed: taxes, FIRA (Foreign Investment Review Agency), and the greater ability of the Canadian economy to support outward investment.

The anecdotal evidence also places a greater emphasis on special tax incentives for individual projects, than on differences in normal tax policies. This is particularly the case for high-profile projects. For example, Black and Hoyt (1989) relate the competition for a Toyota car plant that was eventually won by Kentucky, which the authors

attribute to the $125 million in incentives provided by the state government.

In contrast to the anecdotes surrounding high-profile relocations, the business case literature on multinational enterprises historically placed very little emphasis on taxes as a motivating factor for foreign investment. Typical is the following quote from Professor Louis Wells, a leading authority on multinational corporations and a frequent adviser to such firms (as quoted in Brean 1984):

> I am doubtful that relatively minor changes in tax law or relatively minor incentives, even tax sparing, make much difference. My doubt arises from what I know about how companies make investment decisions ... The practice in almost every case that I have been involved in goes like this: first the deal is negotiated, and then a company tax lawyer tries to minimize the taxes. The decision itself is rarely influenced by the tax laws. When one asks why they do things like negotiate tax holidays in cases where the company will get no benefit, inasmuch as remitted profits become fully taxed in the residence country, (one finds that) the negotiator wants to tell his boss that he did as well as the last negotiator that got a tax holiday.

Discussions with tax professionals in Ernst & Young reveal that larger firms now engage in more sophisticated tax planning that would be indicated by Professor Wells's comments. Thus, there is room for tax considerations to play a role earlier in the site-selection process, particularly since, as noted by Leechor and Mintz (1990), host- and home-country taxes both affect the tax position of a foreign investor under actual tax regimes (in contrast to the view expressed by Professor Wells).

Surveys on Location Determinants

The Survey Approach

Numerous studies have been undertaken that use surveys of business executives to identify the factors they considered to be important in location or relocation decisions. The studies have ranged from mail questionnaires to lengthy and open-ended interviews with executives.

Economists are often sceptical about such survey studies, treating them as an inferior alternative to formal econometric analysis. All

surveys suffer from the potential for biased responses by individuals seeking to promote a particular conclusion in the report. Firms may be reluctant to admit, for example, that a government incentive or tax break did not affect their decision, in the hope of getting further incentives in the future. There are also potential non-response biases in mail-survey approaches.

Furthermore, the respondents to the surveys may not be in a position to accurately identify the factors that motivated their location decision. Mail surveys can be delegated to an inappropriately junior staff person. Even a single senior executive may not be able to speak for a team of managers that collectively reached a particular decision. Finally, the respondent may not be able to disentangle the influence of a single factor in what was a multivariate analysis. This is even more the case for a factor such as taxes, since tax policies could potentially have had an impact on other factors examined (e.g., wage rates and materials costs).

Calzonetti and Walker (1991) cite several advantages of the survey approach to this issue. First, these studies provide rich detail in terms of plant-level data relative to statistical studies on aggregate capital flows or new plant start-ups. Second, the approach lets the researcher deal with actual location-decision makers. Statistical approaches may use complex economic variables of which the decision makers were not even aware. Discussions with decision makers give one a perspective on the type of research or analysis that was done by the firm in selecting a location. Third, the approach enables the researcher to identify all of the factors that were important, rather than a preselected list of variables as is the case in econometric work. Fourth, the research can distinguish between factors considered important in selecting a country from those relied upon in selecting a region or a city.

Finally, Calzonetti and Walker argue that results are generally easier to interpret than the coefficients in a potentially complex econometric model. In our view, this may not, in fact, be the case. First, it is difficult to obtain much quantitative information from a survey result that says that "taxes" were scored, say, 7 on a scale of 10 in importance. Second, one is often unable to distinguish between factors that were unimportant in principle, and those that were potentially important but did not influence a decision in the case examined because the jurisdictions had similar scores on the variables in question.

One important result that does emerge from a wide range of studies

using the survey technique concerns the nature of the location-decision process within business enterprises. The reports collectively confirm that businesses typically engage in a two-stage process, selecting a short list of locations on the basis of a few key variables (markets, reputation, familiarity) and conducting a formal analysis, if at all, on only a few alternative sites. The suggestion is that business perceptions about the tax climate in a jurisdiction could be more important than the actual tax burden in enabling a location to make the short list of sites that are seriously considered.

Surveys Pertaining to Canada or Canadian Firms

Several studies have surveyed Canadian firms or foreign firms investing in Canada on the determinants of their investment-location decisions. These studies have generally concluded that taxes play a modest role in such decisions.

Ernst & Young Survey

Ernst & Young (1989) conducted a telephone survey of 50 senior executives in Canadian and U.S. manufacturing firms in Ontario, Alberta, Quebec, and 9 U.S. states.[2] The survey sample focused on industries where firms were not tied to local markets or resources and where prospects for future investment or restructuring were strong.[3]

The respondents provided weightings on the relative importance of various factors in investment-location decisions. Previous studies and test surveys were used to develop a list of factors that were relevant in location decisions. Firms were initially asked to provide weights on two composite factors – profit/cost and quality of life – with weights amounting to 100 per cent. They then provided new weights, adding up to 100 per cent, on five quality-of-life factors, and a second set of weights adding up to 100 per cent on six profit/cost factors. Finally, two of the profit/cost factors were further divided into three subfactors each, and given weights by respondents.

The average results of this survey are reported in table 1. The variance in responses was quite moderate, given the differences in industries surveyed. Labour and transport costs scored heavily among cost determinants, ahead of government-imposed costs and incentives. Taxes and incentives were each judged to be of fairly modest importance in location decisions.

TABLE 1
Importance of Factors in Investment-Location Decisions Based on a Survey of 50 North American Manufacturers

Factor	Weight (out of 100%)
Profitability and costs	75.4
Labour costs	22.6
Wages/benefits	6.4
Skills	11.2
Degree of unionization	5.1
Energy costs	5.7
Land and building costs	11.7
Availability of support services	7.8
Transport costs	19.0
Government imposed costs/incentives	8.7
Taxes	3.7
Incentives	3.3
Pollution-control costs	1.6
Quality of life for senior employees	24.6
Crime	4.4
Cultural and recreational amenities	4.1
Climate	2.6
Cost of living	8.1
Health care	5.4
Total	100.0

Source: Ernst & Young 1989

Ponting and Waters Prairie Province Study

Ponting and Waters (1985) conducted a similar survey of 100 firms that had considered locating in the Prairie provinces in 1978–83. Establishments from four types of operations participated: trade, finance, or services; warehousing or distribution; manufacturing or research; and headquarters. Of these firms, 89 did select a Prairie-province location, while 20 rejected that location and chose an alternative.

A summary of the the Ponting and Waters study is reported in table 2. On the basis of these results and more detailed findings, they concluded that "the taxation policies of provincial governments are not a major factor influencing locational decisions for firms consid-

TABLE 2
Ranking of Factors in Locational Decisions by 100 Firms Considering the Canadian Prairie Provinces

Factors of Major Importance	
Proximity to customers	Transportation facilities
Cost of land or rent	Wage and salary costs
Prior involvement in that region	
Factors of Secondary Importance	
Proximity to raw materials/supplies	Housing costs/availability
Government incentives	Labour skills
Industrial-park facilities	Fire service
Energy costs	Quality of life for employees
Personal preferences of execs	Water supply
Factors of minor importance	
Community acceptance	Prov./municipal tax policies
Proximity to existing facilities	Waste-disposal services
Labour turnover	Labour militancy
Environmental regulations	Hospital facilities
Climate	

Source: Ponting and Waters 1985

ering locating in the prairie provinces" (736). The number of firms that ultimately selected a province that compared unfavourably in terms of its tax burden relative to the other jurisdictions that had been considered was not significantly different from the number of firms that chose a favourable tax jurisdiction.

Overall, the Ponting and Waters results are broadly similar to those in the Ernst & Young survey, with transport costs or proximity to markets and land/building costs being among the most important factors, and taxes being less important overall.

As shown in table 3, there were some interesting differences in the importance given to federal and provincial policies among companies that located or did not locate in the Prairie provinces. Provincial incentives generally were more important than federal incentives as positive factors promoting investment. Federal policies were more important as negative factors deterring investment, with 42 per cent of firms not locating on the prairies citing federal policies as "extremely important" in this decision. Among the federal policies mentioned most frequently were the regulatory policies (the National Energy Program and FIRA) and taxes. Provincial policies, including taxes, were less of a deterrent.

TABLE 3
Percentage of Firms Citing Government Policies as "Extremely Important" Influences on Location Decision

	Firms that located on the Prairies (%)	Firms that did not choose Prairie location (%)
Federal incentives	13	28
Provincial incentives	17	39
Negative aspects of federal policies	11	42
Negative aspects of provincial policies	4	28

Source: Ponting and Waters 1985

Helliwell Survey

Helliwell (1968) conducted the first major survey on the impact of investment incentives, both tax and non-tax, on investment decisions in Canada. Among the tax measures studied were the time-limited, regionally targeted tax incentives (accelerated depreciation) introduced in 1961, and further depreciation changes introduced in 1963.

He concluded that the 1961 measures did not have any noticeable impact on investment spending and that the 1963 measures affected only the timing of investment spending, and he found little evidence of impacts on business investment-location decisions. Helliwell found that firms did not conduct the types of calculations necessary for incentives to affect their decisions, a result confirmed in another study, by Springate (1973), showing the ineffectiveness of regional-development grants. We note, however, that other surveys, which did not focus on regional impacts (and therefore are not reviewed here), found much more marked impacts of incentives on total investment spending, casting some doubt on the reliability of the survey method as a whole when examining the impacts on incentive beneficiaries. (See Bird 1980, for a review of this literature.)

Harrington, Burns, and Cheung Survey

A survey conducted by Harrington, Burns, and Cheung (1986) reveals some important insights into the locational decisions of Canadian firms investing abroad. The respondents to the survey were 50 Canadian businesses that had established operations in western New York State.

The results of the survey are shown in tables 4 and 5. The motivations for establishing U.S. operations are broadly consistent with other theoretical and empirical investigations of multinational corporations. Firms established foreign production facilities primarily to enter attractive markets while overcoming trade barriers, transport costs, and other disadvantages of direct export. Cost advantages were secondary considerations, and taxes were ranked low as a cost factor.

Not surprisingly, for a sample of firms that selected a border-state location, the respondents indicated that the choice of location within the United States was primarily influenced by proximity to markets (perhaps established initially through direct export from Canada) and their previous familiarity and proximity to this region. Taxes were not cited as a factor in choosing western New York, although incentives were cited by about one-quarter of the respondents. The motives for Canadian firms that located in lower-cost regions of the United States, such as the Southeast, might be quite different from those reported in this study.

Arpan Studies

A number of other studies have conducted surveys of foreign firms investing in the United States, which generally have included a significant number of Canadian firms in the sample. Woodward and Glickman (1991) reviewed two studies conducted by Jeffery Arpan on manufacturing firms that invested in the United States prior to 1980. These studies concluded that "markets, transportation facilities, and labour factors are more important to foreign firms than taxes, incentives, and other state inducements" (p. 194).

Robert W. Haigh (1989) surveyed 20 companies investing in Virginia (including one Canadian firm). The decision to invest in the United States was largely motivated by the attractiveness of the U.S. market, rather than by anticipated cost savings. Within the United States, the choice of a region was largely based on preconceptions or the reputation of the area, rather than on any formal research and analysis. Being close to the market was the single most important factor in selecting a location, and was rated "very important" by 12 of the 20 firms surveyed. "Land, building and tax costs" were rated "very important" by only two respondents, but were "moderately important" for another eight firms. "Economic incentives" were very important for two firms, and "moderately important" for eight firms.

TABLE 4
Motivation of Canadian Firms to Establish U.S. Operations (Number of Companies Citing the Factor as Being Important) $N = 45$

	No. of Firms (multiple responses allowed)
Market accessibility	
Communication	38
Transport	29
Trade barriers	18
Supply, production, and capital cost	
Supply access	14
Plant and equipment costs	12
Capital financing	9
Tax payments	6
Labour	
Availability of appropriate labour	11
Cost of appropriate labour	5
Exchange rate	
Relative strength of Cdn $ since 1977	14
Relative strength of Cdn $ before 1977	6
Technology	
Access to U.S. technology	8

Source: Harrington, Burns, and Cheung 1986

U.S. Studies

Numerous U.S. surveys of executives have been done, dating back to the 1940s, that have examined the influence of taxes and other factors on regional, state, and local location decisions. Although the findings of these studies vary, they broadly suggest that taxes are a moderately important factor in location decisions, well behind market proximity and labour considerations.

Early Surveys

The early surveys are summarized by Morgan (1967), who reviews 24 separate studies conducted in the 1940–65 period, largely conducted by state universities. As shown in table 6, these early studies achieved a high degree of consensus on the influence of state and

TABLE 5
Reasons Why Canadian Firms Chose Western New York (Number of Companies Citing the Factor as Being Important) $N = 43$

	No. of Firms (multiple responses allowed)
Proximity and familiarity	
Distribution to relevant markets	26
Familiarity with region	18
Proximity to Canadian parent	16
Labour	
Availability of managerial staff	14
Cost of appropriate labour	10
Availability of technical workers	8
Availability of skilled production workers	5
Supply availability and cost	
Access to materials	13
Cost of land	7
Cost of power	4
Government policies	
Publicly provided incentives	11
Foreign trade zones	3
Availability of technical information	7

Source: Harrington, Burns, and Cheung 1986

local taxes and other factors as determinants of location decisions. With only one exception, taxes were found to be of little significance in choosing U.S. business locations.

More recent studies appear to accord a somewhat larger role for taxes and other state government policies. Ziegler (1990) also concluded that the trend in such studies is towards a greater role for such factors as unionization, quality of life, and the state business climate. Taxes appear to play a moderate rather than an insignificant role in investment locations, but still have much less influence than markets or labour costs, according to the results of these surveys. Since there are a large number of such survey studies, in the remainder of this section the results of a range of studies that typify this literature are summarized. Our review is, in part, based on literature reviews reported in Wasylenko (1991) and Calzonetti and Walker (1991).

TABLE 6
Results of 24 Early U.S. Surveys of Location Decisions (Number of Studies)

Factor	Primary significance	Secondary significance	Little significance
Markets	22	2	–
Labour	13	11	–
Raw materials	13	10	–
Transportation	7	16	–
Taxes	1	3	14
Financial inducements	–	0	20

Source: Morgan 1967, as reported in Calzonetti and Walker 1991

National, Multi-Industry Studies

A study conducted by Fortune Inc. (1977) on U.S. facility-location selection by the 500 largest U.S. companies provided insights into location decisions of large firms.

As in Canadian surveys, the Fortune Inc. study found that labour costs and skills, proximity to markets, and transportation facilities are among the most important factors in location choices. In contrast to the Canadian results and those from early U.S. studies, "state and local attitudes towards taxes on business and industry" were also found to be of major importance, ahead of such secondary factors as quality of life, land and construction costs, incentives, and regional market growth. State and local personal income taxes were judged to be of minor importance.

Surprisingly, Schmenner (1982) reached a much different conclusion on the importance of taxes in his nearly contemporaneous study of Fortune 500 firms. Schmenner's report used Dun and Bradstreet establishment data to track changes in the establishments operated by these large companies, with a follow-up survey to identify motivating factors for the changes observed.

Schmenner found that a decision to relocate a facility is a rare event. The vast majority of firms neither expanded nor opened new plants during the 1972–78 period. Of the 17,759 plants in 1972, only 1611 opened new branches at other locations, and a mere 450 relocated. Expansion on site is by far the most frequent method of increasing production capacity, and nearly half of the firms that opened new branches or relocated did so because of lack of space to expand at their existing site.

Among the firms opening branches at new locations, 33 per cent

mentioned hedging against the risks of labour strife or a natural disaster at existing locations. Twenty-six per cent looked to a new location to escape unproductive labour. Only 1 per cent mentioned the desire to flee high taxes or a bad business climate as a reason for opening a facility in a new location.

It is difficult to identify the reasons for the different results in the two studies of Fortune 500 firms. However, it may be that, by surveying firms in relation to a particular relocation or branching decision, Schmenner obtained results that are closer to the motivations that surrounded actual location decisions.

Calzonetti and Walker (1991) report on the results of the West Virginia University Industrial Location Project. The project studied 739 respondents to a mail survey of firms that established new manufacturing plants from 1978 to 1988. Of these firms, 174 conducted a search across regions in selecting a state or group of states for the new plant. The factors considered important by these firms in their regional search are summarized in table 7.

Thus, taxes were considered to be a very important consideration by nearly half of the firms surveyed, although they were rarely the most important consideration in selecting a region. Taxes were the third most commonly cited very important factor by branch plants, but were ranked only fifth by single-plant establishments (behind personal reasons and land). Taxes were rated only eighth in importance by firms selecting the regions near Ontario (New England and East North Central).

The West Virginia University study also reported on the factors considered by the firm in selecting a town or city within the state or region selected. Property taxes ranked only eighth in importance in this local search, after markets, non-union labour, highways, wages, livability, land costs, and available vacant site.

Single State or Regional Studies

Several recent surveys considered the motives of firms that had chosen a location or considered locating in a particular state or region. According to a summary of their results by Calzonetti and Walker (1991), most of these studies show that the labour climate has a significant influence on location decisions, particularly for multi-plant firms. Wage rates and unionization are important variables for firms in this regard.

Regional and local market demand factors play an important role,

TABLE 7
Factors Important in Selecting a Region for 174 U.S. Manufacturing Plants Opened in 1978–88 (Number of Respondents Citing the Factor as Very Important)

Factor	No. of firms citing factor as the "most important" consideration in selecting a region	No. of firms citing factor as the "most important" or as "very important" in selecting a region
Markets	53	110
Labour	31	110
Land	8	91
Taxes	5	83
Personal reasons	18	65
Education	5	63
Resources	11	60
Non-tax incentives	10	55
Electricity prices	2	53
Proximity to suppliers	2	49

Source: Calzonetti and Walker 1991

particularly for single-plant firms. Market demand also shows up as very important in studies that surveyed firms on how they narrowed down the region of interest, along with labour-related factors and building costs.

For the most part, taxes or state-level government/business relations play a secondary role according to these regional surveys. Single-state studies in some cases find a larger role for taxes than most multi-state surveys. For example, taxes were found to be the second most important factor (after labour costs) among firms considering Arkansas, and a "pro-business" state attitude was the second or third most important factors for firms that chose Tennessee. It may be that the sample of firms that considered or actually located in a low-tax state are those that were most heavily influenced by taxes in their initial search.

Single-Industry Studies

We identified two studies that have explored locational determinants through surveys of executives within a given industry or type of establishment.

Lopez and Henderson (1989) surveyed newly established food-processing plants in five eastern states – New Jersey, Pennsylvania, New York, Delaware, and Maryland. Six overall business-climate fac-

tors were ranked in importance (market, infrastructure, labour, personal, environmental regulation, and fiscal policy) in location decisions, and these were further disaggregated into 41 individual factors. The results indicate that plant locations are most affected by market and infrastructural factors. Fiscal policies, including taxes and incentives, were still found to be significant determinants of locations.

Samuel Rabino (1989) surveyed the presidents of 31 high-technology firms on the factors that led to relocation of research-and-development facilities from the United States to other countries. Foreign tax incentives or domestic tax disincentives were not found to be important factors in decisions to place research-and-development efforts outside the United States. The survey respondents stressed the role of "infrastructure," such as the availability of skilled workers and economic and political stability, in decisions to move research-and-development facilities.

Statistical Analyses of Location Decisions

A number of studies have used statistical methods to identify the causes of industrial location or relocation decisions. Although there is some Canadian work, the literature is heavily dominated by U.S. studies. Data on 50 states provide a sufficient sample size for multivariate regression analysis, while 10 provinces would not be sufficient to replicate these cross-section studies.

Furthermore, although we have not formally analysed the data, the impression is that Canada has not seen the major interregional shifts in business activity that characterized the U.S. economy in recent decades, which has seen a major move to the South and West. At least in terms of the degree of public attention, for Canadian policy makers the most important shifts have likely been between Canadian and U.S. locations. The difficulties in obtaining comparable data between Canadian provinces and U.S. states, and the complexities posed by exchange-rate movements, would make it difficult to conduct cross-border econometric studies at the state/province level.

Despite the U.S. focus of much of this literature, we believe that it may still reflect the causal forces that underlie movements in investment between Ontario and other jurisdictions. Such would be particularly the case for choices between Ontario and other Canadian provinces. Taxes could have a greater influence on investment decisions between Ontario and U.S. locations than would be evident in interstate choices within the United States, since national as well as

state/provincial tax differences could play a role. However, there is no a priori reason to believe that the *elasticity* on the tax variable – i.e., the degree of investment response to any given tax-rate differential – would be any larger for international choices. Indeed, since the other, non-tax differences in jurisdictions across an international border are likely to be greater than those across a state boundary, one might suspect a lower response to a given tax differential.

Three types of empirical studies using statistical methods exist. The simplest approach is essentially a single-variable correlation between tax rates and industrial location choices, examining the extent to which investment has been drawn to lower tax states. A second approach uses multivariate regression analysis on time-series data on interjurisdictional investment flows in the aggregate. A third line of research uses cross-section or cross-section–time-series panel data on investment-location choices at the firm or establishment level, and attempts to model the decision process using multivariate regression analysis.

Much of the research suffers from methodological or data weaknesses, which we comment on in individual cases. One area of difficulty involves the choice of the tax variable. Most analysts would suggest that the effective tax rate is the appropriate variable, and this has been the most widely applied in single-jurisdiction studies relating taxes to investment decisions (as opposed to the relocation-determinants literature examined here). In practice, those who apply the effective tax rate approach must rely on a number of simplifying and unrealistic assumptions, including myopic expectations (investment depends only on today's tax rates, rather than a rationally expected stream of present and future tax regimes). Researchers also tend to ignore some of the specialized tax treatments in such sectors as real estate, resources, and finance, as well as the complexities associated with the tax treatment of foreign investors. It is therefore not surprising that empirical models conducted on very broad aggregate investment data can, in some cases, fail to identify tax policy impacts that have differential impacts across firms.

The location-determinants literature often uses even less theoretically sound tax variables, including the statutory corporate tax rate, tax collections as a share of income or the gross domestic product, or the share of taxes raised through corporate taxes. Since these may bear little relationship to the effective tax burden on an individual investment, their use poses problems in interpreting the significance of the results of these studies.

A further potential problem lies in the potential relationship be-

tween tax rates in a jurisdiction and variables omitted from the model that affect other input prices (e.g., labour). For instance, a jurisdiction that is otherwise unattractive for investors because of factors not incorporated in a model may feel the need to use low taxes as an attraction for business. The impact of these omitted variables would be to reduce the estimate of the true impact of taxes on investment decisions. In contrast, jurisdictions that adopt low business taxes may be ones with other, pro-business policies not modelled by researchers (lax environmental standards, anti-union policies, etc.), and the tax variable could falsely pick up the influence of these other policies. This may be a problem in U.S. research, where the dominant trend has been from relatively "liberal" states in the North to the more "conservative" political climate in the South and West. Slemrod and Shah (1991) attempt to control for changes in the supply of foreign-investment opportunities (in a model of foreign investment in Mexico), but such adjustments typically are not made.

Among the other problems that are common in the literature are poor econometric techniques and errors in the data on corporate locations.

Simple Measurement Studies

James Miller (1984) examined Dun and Bradstreet data on U.S. plant relocations from 1969 to 1975, and measured the net flows across state lines in terms of the number of plants involved. As shown in table 8, the net flows across states were highly negatively correlated with a measure of the "tax burden" in the state. Unfortunately, the study does not provide a definition for the tax variable used.

A further hazard with this single-variable approach is the potential for omitted-variable bias. It may be, for example, that states that are economically strong are able to impose lower tax burdens on their corporations as a result of higher per-capita revenues overall. Thus, the simple-correlation approach offered here could fail to pick up the true causal forces behind the relationship. A further problem lies in the Dun and Bradstreet data itself, which other researchers have had to adjust carefully owing to errors in location descriptions and other variables (Bartik 1985).

Romo and Schwartz (1990) examined the characteristics of the firms that had migrated in and out of New York State between 1960 and 1985, a period in which manufacturing in the state suffered a sharp decline. They found that most of the nearly 4000 relocations identified

TABLE 8
Summary of U.S. Relocations, 1969–75 (Number of Plant Relocations)

	Moves to a lower-tax-burden state	Move to a higher-tax-burden state
Net relocations to adjacent state	411	66
Net relocations to non-adjacent state	109	11

Source: Miller 1982

were within the state or to a neighbouring state, since market and other forces had compelled firms to remain in the same region. Furthermore, while cost savings were generally thought to motivate moves, only one-third of the firms in the sample achieved labour cost savings as a result of their move, and fewer than 1 in 10 realized labour cost savings in excess of 20 per cent. Their analysis suggests that local tax incentives and subsidies for new facilities are important in motivating these intraregional moves.

Models of International Foreign Direct Investment

As noted above, one potential empirical approach to investigating the impact of taxes on investment locations entails modelling the aggregate flows of interregional and/or international capital investment. This is somewhat removed from the core of the issue being examined in this paper, since investment flows need not be accompanied by new location or relocation decisions, because they include investment of retained earnings and expansions of existing facilities.

Although Ontario and Canada as a whole have been significant beneficiaries of foreign direct investment, surprisingly little research has been done on the determinants of these flows in the aggregate. Similarly, Canadian economists have not examined the flows of capital across Canadian regions. Jones and Whalley (1989) concluded, after a search for such work, that "there are no good estimates of the elasticity of capital flows in response to differences in the rate of return either between regions or between Canada and the rest of the world" (p. 386).

The only study identified in the literature search is that of John Murray (1982), which concerns only flows of U.S. foreign direct investment (FDI) in Canadian manufacturing. Murray applied a neoclassical investment model, similar to those of Jorgenson and others for closed economies, to explain annual flows over 1948–78. He finds

that a U.S. FDI is quite responsive to changes in Canadian tax provisions.

Capital investment responds in a partial adjustment process to changes in the desired capital stock that is a function of the user cost of capital. The cost of capital, in turn, is dependent upon the tax rate, depreciation allowances for tax purposes, and investment tax credits. The tax variable used is therefore a standardized effective tax rate on manufacturing.

Murray noted that Canadian effective tax rates over the period studied, including federal, state, and provincial taxes, tended to be lower than those in the United States owing to the U.S. excess profits tax (1950–53) and Canadian investment incentives (accelerated depreciation, tax-exempt intercorporate dividends, etc.).

Taxes are shown to be a factor in FDI flows in the sense that the fit of the investment equation is significantly improved by the inclusion of the tax variables in the user cost of capital term. Murray then estimates a log-linear model that splits the user cost of capital term in order to allow the model to pick up differences in the elasticity of investment with respect to tax rate, credit, and depreciation allowance terms, and runs the model with and without the inclusion of certain tax provisions.

Table 9 provides a summary of the results of this time-series analysis, including the coefficients on the tax-related variables. (Other variables in the equation relate to interest and economic depreciation rates, and the U.S. dollar value of internal cash flows of subsidiaries.) The results suggest that taxes are a significant determinant of investment flows, with the elasticities in the equation generally around 1.

In simulation analyses, he shows that U.S. investment in Canada could have been altered by as much as 40 to 50 per cent with a U.S. tax policy that eliminated biases in favour of capital exports. Brean (1984) challenges the validity of these simulations, on the grounds that they require implausibly strong assumptions on the linkage between multinational corporate finance (in particular, internal cash flows of the subsidiary) and investment.

Murray's results must also be judged on the validity of the neoclassical approach itself, which is dependent upon the partial adjustment mechanism assumed and which does not incorporate any forward-looking or expectation variables on taxes or economic variables (including exchange rates). A further limitation of Murray's work lies in the assumption of a Cobb-Douglas production function for foreign-owned manufacturing firms, which may be overly restrictive.

TABLE 9
Summary of Model of U.S. FDI into Canadian Manufacturing

Dependent variable:
$\ln \{ [q_t I_t + \lambda (1 - \delta) q_t K_{t-1}] / p_t Q_t \}$

where: q = price of a unit of fixed investment
I = units of fixed investment
qI = book value of U.S. direct investment (retained earnings + depreciation plus net U.S. capital outflows to Canada)
λ = rate of adjustment of capital stock to desired level ($0 < \lambda < 1$)
δ = economic depreciation rate = 0.1209
K = capital stock (in units of fixed capital)
p = price of a unit of output
Q = units of output
t = year

Selected independent variables (time subscripts omitted):	Estimated coefficient:
$\ln (1 - \tau)$	0.5 to 1.2
$\ln (1 - \tau M - k)$	−0.77 to −2.9
$\ln (1 - \Delta)$	−2 to −3

Where: τ = statutory corporate tax rate (fed. + prov.)
M = present value of depreciation allowances
k = investment tax credit as a % of q
Δ = marginal withholding taxes on foreign dividends remitted to the parent company

Source: Murray 1982

It also ignores portfolio considerations that may be important in the international allocation of capital. In addition, since Murray reports on only a single specification, one cannot be certain of the robustness of his results to potential changes in the statistical methods used.

Murray's results were also supported by D. Hartman (1984), who found that taxes were statistically linked to FDI flows into the United States. Regression equations on reinvested earnings and FDI flows show that a 10-percentage-point tax reduction, which would reduce the total tax collection on income earned by foreign assets by 20.9 per cent, would result in a 20.4 per cent increase in aggregate net direct investment undertaken by foreigners in the United States. Hartman notes that the model used is an overly simple one on annual net investment, and therefore cautions that the results are illustrative only of the actual impacts.

A more recent study by Kan Young (1988) using a longer time series confirmed the elastic response of retained-earnings reinvest-

ment (an elasticity of −0.47 to −1.81) with respect to changes in the tax rate applicable to foreigners, but found a lesser response than Hartman for the flow of new funds (elasticity of −0.40 to −0.70). Newlon (1987) used both a long series and one that corrected for an error in the rate of return data used by Hartman. In this longer and corrected series, the equation explaining foreign direct investment from the transfer of new funds has a poor fit, with no statistically significant coefficients.

Both Murray's and the U.S. models cited above implicitly use an average tax rate, which Shah and Slemrod (1991) note may be very poorly related to the more appropriate marginal tax rate. The use of an average tax rate poses a potential "simultaneity" problem – since periods in which investment is stronger result in greater deductions and credits for capital expenditures – that therefore lowers average tax rates. Thus, investment and average tax rates would be negatively correlated (as shown in the model), but it could be the higher investment spending that is causing the fall in average tax rates, rather than the reverse.[4] Recent theoretical work suggests that the Murray, Hartman, and Young models are also improperly specified. They are based on the assumption that FDI decisions are unaffected by home-country tax policies. This result is based on the conclusion that the home-country tax is capitalized in the value of the firm and therefore has no impact on the firm's foreign-investment decisions. Leechor and Mintz (1990) and Hines (1988) demonstrate that there are a number of ways in which actual home-country tax systems affect investment and financing decisions, even in the case where the source of capital is retained earnings.

Slemrod (1990) developed an alternative model of aggregate FDI into the United States, incorporating a measure of marginal as opposed to average tax rates. He found a negative impact of taxes on total FDI and on FDI from new transfers of funds, but no impact on FDI from retained earnings.

Slemrod and Shah (1991) extend this type of analysis to allow for the joint impacts of host- and home-country taxes on inbound foreign investment in Mexico, and also control for changes in the economic and regulatory climate that affected the supply of opportunities for such investment. They tested alternative models using effective marginal tax rates, average tax rates, and statutory tax rates, and found that the marginal rate performs most consistently. Their findings show that investments from both retained earnings and transfers are sen-

sitive to changes in Mexican tax policy, with, for example, the elasticity on reinvestments with respect to the marginal rate being −1.5.

The significant role for taxes in these models of FDI flows appears to contrast sharply with the survey evidence discussed above. One explanation lies in the fact that the survey results pertain largely to flows of new funds (for new establishments) that are found to be less elastic with respect to tax changes than are reinvested funds. Prachowny and Richardson (1975) use empirical evidence and theoretical arguments based on a life-cycle model of the multinational firm to show that tax incentives may not attract new enterprises, but may result in the expansion of existing foreign-owned firms. Brean (1984) similarly concludes that "although taxation is relatively unimportant in regard to decisions to establish new operations, mounting evidence points to the interaction of national tax systems as a significant determinant of the growth of established foreign subsidiaries" (p. 88).

Claudy Culem (1988) modelled FDI flows among the United States, Germany, France, the United Kingdom, the Netherlands, and Belgium over 1969–82. Tax variables were not, however, included in this model. Culem found that market size and growth, tariffs of the host country, unit labour costs, and unit labour cost differences (between host and home countries) were important determinants of bilateral FDI flows.

Models of Regional Investment Decisions

Canadian Studies

One group of studies explores the regional consequences of Canadian tax and fiscal policies in a general-equilibrium framework. (See, for example, Jones and Whalley 1989 and Damus, Hobson, and Thirsk 1991). While they offer interesting insights into interregional welfare impacts of alternative policies, they do not really shed any light on the impacts of tax differences on business-location decisions. This conclusion is based on the fact that the models incorporate assumptions on capital mobility that are not based on any empirical estimates (in contrast with the other elasticities in the model, which do reflect previous research results). Thus, the results of the model on capital flows are driven by non–empirically based assumptions rather than by the relationships within the model.

The remaining Canadian literature on regional investment and location decisions is largely focused on the role of tax and non-tax

incentives. Much of the literature relates to evaluating the effectiveness of particular programs aimed at spurring regional development, and therefore is not generally focused on Ontario.

Cohen and LeGoff (1987) prepared a recent review of empirical studies on the effectiveness of tax and non-tax regional development incentives, including both survey approaches and econometric studies. The former are characterized as being of little use, since they suffer from significant biases in responses (e.g., respondents being unwilling to concede that they would have gone ahead with a project in the absence of the incentives), and the inability of respondents to more than guess at what they would have done under a different tax regime.

The several statistical studies cited are also viewed as being unreliable, because they generally have severe data problems and weak econometric techniques. The conclusions of these studies do not appear to be robust; slight variations in their specifications lead to large changes in the significance of tax or incentive variables. On the whole, Bird (1980) concluded that the econometric studies show much less of an impact of tax incentives on investment decisions than some of the survey literature (e.g., the survey by the Tax Measures Review Committee). Bird sums up the evidence on locations from both surveys and econometric work with the conclusions that "regional incentives may have increased investment in the favoured regions a bit" (p. 48).

Aside from the incentives literature, which addresses aggregate investment rather than business locations, no work has been identified that explores the impacts of normal provincial tax policies on location decisions within Canada using an econometric approach. However, many econometric studies have explored investment location decisions among the U.S. states. It is believed that this literature offers some insights into the role that taxes play in regional location decisions affecting Ontario.

U.S. Studies

Models of Business Location or Investment. Econometric analysis of business-location decisions in the United States dates back to the 1950s. As indicated in surveys of this literature by Due (1961) and Oakland (1978), studies conducted prior to the mid-1970s tended to find little evidence of a significant role for state and/or local taxes in business-location or -relocation decisions.

Dozens of further studies have been conducted in the last two decades. While the results of this more recent work do vary, the general trend in the literature is towards a somewhat more significant role for tax differences in location decisions, at least in the sense that the studies no longer reach a uniform conclusion that there are no tax impacts. The results broadly support the conclusions of the survey research that imply that taxes are secondary in importance to other factors. However, several studies fail to identify any impacts of state and local tax differences.

Many of the studies that do not identify significant tax impacts on new plant creation appear to suffer from an inappropriate choice of the tax variable or a problematic econometric technique. D.W. Carlton (1983) uses a single tax variable that pools corporate and personal taxes in the state. An earlier study by Carlton (1979) also suffers from a small sample of metropolitan areas covered and the use of a conditional logit model requiring an assumption of the independence of irrelevant alternatives. The latter may not be valid if unobserved characteristics of one location are correlated with those of a neighbouring location. (See Newman and Sullivan 1988 for further discussion of this issue.) J.H. Hodge (1981) applies a similar method on regional investment by 4 manufacturing industries in 42 metropolitan areas and finds significant negative relationships to corporate income taxes in 1 industry, and a negative relationship to property taxes in 2 of the industries.

R.A. Nakosteen and M.A. Zimmer (1987) also employ a problematic measure of taxes, namely, the ratio of state corporate income taxes to state employment. This could equally be a proxy for the capital intensity or profitability of industry in the state as opposed to a measure of the rate of taxation. Thus, the result that this variable has no relationship with the number of new branch plants does not shed much light on implications of changes in effective tax rates. Woodward and Glickman (1991) make a similar error in using the percentage of state income raised through corporate income taxes as their measure of the tax burden in modelling the location decisions of foreign firms. This variable would pick up differences in capital intensity and corporate profitability as well as differences in tax rates on profits. A state with low corporate *and* low personal and sales tax rates could also score poorly on this measure.

Bartik (1985) used a conditional logit model similar to that of Carlton, but employed dummy variables to correct for unobserved regional characteristics. He used Schmenner's data on new branch plants

opened in the 1972–78 period by Fortune 500 companies. Bartik finds that unionization has a strong negative impact on new plant openings, and also finds significant impacts for wage rates (negative), existing manufacturing activity (positive), and road mileage (positive) – a poor proxy for infrastructure. Corporate profits taxes (measured as an average effective rate on assets) and business property taxes are both significant deterrent variables, with a 10 per cent increase in each resulting in a 2–3 per cent and 1–2 per cent decline in the number of new plant openings, respectively. Variables for education, construction costs, population density, and energy prices do not perform well.

M. Kieschnick (1981) used a "typical firm" profile to estimate effective tax rates for 13, two-digit standard industrial classification manufacturing industries, by creating hypothetical financial statements from the (U.S.) Federal Trade Commission (FTC) and the Internal Revenue Service data. In contrast to Bartik, he finds little impact of changes in state tax loads on the interstate allocation of gross investment in these industries.

Bruce Benson and Ronald Johnson (1986) use pooled cross-section, time-series data to explain trends in manufacturing investment in plant and equipment by state over 1966–78. They allowed for lagged tax effects by allowing the six years of lagged tax rates to influence investment behaviour in a given year. (One might argue that investment should also depend on expectations of future tax rates in the state.) The tax variable chosen is again less than desirable, being the ratio of total (corporate and personal) state and local taxes to state personal income. They found a significant negative impact on state manufacturing investment, as well as lagged impacts.

Schmenner, Huber, and Cook (1987) use data on the location of branch plants opened by the Fortune 500 companies in the 1970s, coupled with survey data to identify how the firms selected a region and then a final location within the short list. Tax and other fiscal variables were significant in the first decision, but they found little explanatory power for such variables in the choice of a final location.

Neal Schmitt, Sandra Gleason, Bruce Pigozzi, and Philip Marcus (1987) use an interesting mix of surveys and statistical analysis to explore relocation decisions made by 438 Michigan businesses. They surveyed firms on their overall impression of the business climate, and then on their views on individual elements of the business climate. Data were also gathered on their relocation activity. The firms' overall ratings of the business climate were most heavily correlated

with their views on tax considerations, and, secondarily, with labour problems. However, their overall rating of the business climate was not statistically linked to business relocations. Rather, relocation decisions were correlated with distance to markets and labour considerations.

Leslie Papke (1991b) has undertaken a number of studies on state investment or business birth trends. Papke is perhaps the most sophisticated of the authors reviewed here in defining the tax variable. She calculates an effective tax rate (ETR) on hypothetical marginal investments in each state by comparing an assumed pre-tax rate of return and the calculated after-tax rate of return. Papke (1987) initially applied the calculations to only a single year of cross-section data, but has subsequently extended her work to time-series, cross-section data for the late 1970s and early 1980s.

The results of this work are somewhat mixed. Papke (1991a) demonstrated that the state ETR is statistically significant in two of the five industries studied (and marginally significant in a third) in explaining the trends in the number of births of new firms by state for 1977–82. The calculated elasticities suggest that a one-percentage point increase in the ETR (from 50 to 51 per cent) would reduce the number of births in outerwear by 26 per cent, in printing by 8.8 per cent, and in communications by 3.2 per cent. High wages were also negatively related to new births. However, other variables, such as land prices and energy costs, perform poorly, and the ETR is positive and significant in one of the industry equations, suggesting that the models may be misspecified.

Papke (1991b) explores variations in the dollar value of capital investment in five manufacturing industries across states for the same period. Although she discusses at length the differences in the ETR elasticities of investment across the industries studied, it is noted that none of the industry equations has a statistically significant ETR coefficient. Furthermore, wages and energy costs both report positive and significant coefficients in some of the equations, again casting doubt on the model specification itself.

Models of State Economic Growth. A number of studies examine the influence of taxes on measures of state economic growth rather than on location choices or investment. These studies therefore may be capturing not only impacts on investment location decisions, but also impacts of taxes on the growth of existing firms. The results of these studies are quite mixed, and, taken as a whole, inconclusive.

T.R. Plaut and J.E. Pluta (1983) fail to find impacts of tax- and fiscal-policy variables on three measures of state economic growth, and, in fact, find a positive link to property tax rates. They did, however, find a positive link between overall ratings of a state's business climate and its economic growth performance. Among the major problems with their methodology is the assumption that all of the observed growth over 1967–77 can be related to the levels of explanatory variables that prevailed in 1967, and the odd choice of tax variables (a "tax effort" variable that measures state and local taxes as a percentage of "fiscal capacity"). A study by Wheat (1986), which also found no tax effects, makes excessive use of data transformations to improve the fit of his equations, resulting in a final regression equation with a hard-to-justify mix of logs, squares, and interactive explanatory variables.

Newman (1983) finds that changes in state employment growth in 15 manufacturing industries, relative to the national trend growth, is significantly affected by changes in the state's relative corporate tax rate. The tax variable is thus the corporate tax rate in the state relative to the average corporate tax rate. The impacts are greatest in rapidly growing and highly capital-intensive industries.

L.J. Helms (1985) also finds a link between state personal income growth rates over 1967–79 and tax policies, but also notes that greater state expenditures on education or infrastructure lead to more rapid income growth. Thus, taxes raised to finance such expenditures could have a positive impact on income growth.

Wasylenko (1988) similarly reports a negative link between employment growth and state/local taxes as a share of state income for total manufacturing and non-durable manufacturing, and a positive link between employment growth and state expenditures, in some cases. However, an earlier paper by Wasylenko and McGuire (1985) failed to find significant links between either effective or nominal corporate tax rates and state employment.

Indirect Impacts of Taxes on Business Location

The survey literature, as well as some of the statistical analyses reviewed above, deals with only the direct impact of taxes on investment-location decisions. Most of the econometric studies, for example, examine taxes as a variable explaining investment decisions while separately controlling for the influence of wage rates, market demand, and other factors.

These other factors may not, in fact, be independent of tax policy in a jurisdiction. Personal income and sales taxes could affect the market prices for business inputs, for example, or the demand for business products. Thus, the studies that include these non-tax explanatory variables could hide some of the influence of tax policy in the impacts attributed to other variables.

As we noted above, general-equilibrium models that attempt to integrate taxes with other economic variables suffer from the lack of evidence on the relevant elasticities. There is some evidence, however, about how taxes affect a few of the variables of interest in location studies. In this section, the current state of knowledge on the potential impacts of taxes on other criteria that are important in business location decisions is explored.

The general conclusion is that the current state of the art leaves much uncertainty about the potential impacts of taxes on determinants of business locations. This view is nicely summed up by Pierre Fortin (1989, 419): "Great uncertainty still characterizes our knowledge of [tax impacts on] labour supply, saving and investment behaviour, productivity and efficiency, and international portfolio behaviour. These phenomena are complex, interdependent, and plagued with difficult measurement and modelling problems. Theory is often far ahead of measurement and empirical verification. We have, for example, sophistical theories of saving and investment that are consistent with an important role for taxation, but for which the empirical evidence is often inconclusive or controversial."

Impacts of Taxes on Labour Supply and Wages

Taxes could affect business locations through impacts on labour markets in two ways: (1) by inducing individuals to migrate, leaving fewer individuals with key skills and bidding up wage rates as a result (see Day and Winer 1993); or (2) by shifting the labour supply of residents in the jurisdiction which also results in a bidding-up of wage rates.

Ernst & Young and Kesselman (1991) concluded that little is known about the tax impacts on migration from abroad, and that while taxes have been shown to deter in-migration, some areas of public spending promote in-migration. Thus, the net impact of tax differences would depend on the nature of the resulting differences in public expenditures. The literature also sheds no light on the impacts of taxes on the composition of migrants (i.e., the type of people attracted to a province).

For the second effect, the extent to which personal income taxes affect market wages is part of the difficult area of a study known as the "incidence" of taxes. In theory, personal income taxes could be shifted forward onto buyers of labour services by reducing labour supply and bidding-up market wages. If so, personal income tax differences would show up in wage differences, which, in turn, would reduce the attractiveness of a jurisdiction to investors (ignoring exchange-rate offsets). However, personal income taxes could actually increase labour supply in theory, as a result of the well-known possibility of a backward-bending labour supply curve.

The empirical evidence, as reviewed by Ernst & Young and Kesselman, suggests that the existence of the personal income tax may affect labour supply, although the total impact of modest tax changes is likely to be small. Ernst & Young and Kesselman (1991) report that the typical response in U.S. labour supply, with respect to personal income tax increases, is small and positive for adult males. The results of Canadian and U.S. studies on female labour-supply responses vary widely. Two survey studies cited by Boadway and Kitchen (1980) involving different samples of Canadian workers found little evidence of taxation impacts on aggregate labour supply.

The evidence for Canada, as summed up by Fortin (1989), is that personal income taxes are largely borne by labour, and that little shifting onto wages occurs; that is, wages are not bid-up to employers to compensate employees for personal income taxes. Less than 20 per cent of the personal income tax was found to be shifted onto wages in a 1983 Department of Finance study by Denis Guindon. All eight major macro-economic models of the Canadian economy, in fact, assume no impact of personal income taxes on labour costs. Thus, differences between Ontario personal income tax rates and those of other Canadian jurisdictions are not likely to be a significant source of interprovincial wage rate differences.

The business-location literature provides little support for impacts of personal tax burdens on business locations. Survey studies, with the exception of the Fortune Inc. (1977) study, generally either include all taxes in a single variable or ask only about the influence of business taxes. The Fortune Inc. survey found that personal income taxes had little influence on business-location decisions.

Most statistical studies either aggregate personal income taxes in a single tax variable with corporate taxes or exclude them as a variable. Wasylenko (1988) included a measure of the degree of personal tax progressivity in his analysis of state employment growth, but the

results were mixed across industries, with some positive and some negative coefficients reported. Carlton (1979, 1983) and Plaut and Pluta (1983) failed to find a statistically significant link between personal taxes and employment or new establishment counts.

Impact on Savings

Lawrence Summers (1988) and others have noted that domestic savings and investment rates tend to be highly correlated across countries. Thus, although one might expect international capital mobility to eliminate this relationship, this is not the case in practice. (Summers attributes this to macro-economic-policy makers' use of monetary and fiscal policy measures to avoid large capital inflows and outflows, while others have pointed to transactions and information costs.)

Thus, to the extent that Ontario taxes affect savings decisions, they might also affect investment in the Ontario economy (although cross-provincial border capital flows might be more fluid than those across national boundaries).

The taxation of capital income reduces the after-tax return received by savers. In theory, this reduction in the real after-tax interest rate can either increase or decrease total savings.

Ernst & Young and Kesselman (1991) review the empirical evidence on the relationship between after-tax returns and savings. The results in the literature vary widely. Many studies find no significant linkages between real net returns and savings. A few find negative elasticities; others find fairly large positive ones. The sole Canadian study cited found an estimate of 0 to 0.6. Ernst & Young and Kesselman concluded that, taken as a whole, the literature is inconclusive in terms of whether changes in taxes that affect net returns on capital in fact affect private savings and investment.

Impacts on Prices and Local Market Demand

Tax differences that are passed on in the form of higher selling prices can have two impacts on business-location decisions: (1) price increases raise business energy and material input costs and thereby affect one of the factors shown to be important in some location studies; and (2) price increases could reduce consumer demand and therefore reduce the size of the local market, often an important factor according to business-location studies.

Sales taxes are the most frequently cited source of tax impacts on

prices. Fortin (1989) suggests that the evidence demonstrates that sales taxes are shifted forward to consumers. A Department of Finance study he cites shows that more than 80 per cent of sales taxes are passed on in higher prices to purchasers. Most of the studies of the impacts of federal sales tax reform assumed complete forward shifting of the savings resulting from the elimination of the FST.

Sales taxes do not tend to be major business input costs, particularly since federal sales tax reform eliminated most taxes on business inputs through the provision of credits. This change could potentially reduce local market demand for such items and act as a deterrent to manufacturers, wholesalers, and retailers serving the local market. Such would not be the case for items that are exported.

Personal income taxes also act to reduce household purchasing power, and thereby affect local market demand for some items. However, the spending of taxes by governments or transfer-payment recipients would create additional demand for other goods and services.

Impacts on Business Infrastructure

As already noted, taxes serve as a source of revenue for the provision of public goods. Some differences in tax burdens may reflect different levels of government spending on items such as roads, airports, schools, and other goods and services. To the extent that these items are valuable to businesses, the higher levels of spending could offset some or all of the costs associated with the tax differential.

Most of the survey literature found some degree of emphasis placed by businesses on such items as labour market skills and education, transportation infrastructure, and local quality of life (hospitals, schools for employees' children, and so on). A few of the U.S. empirical studies, including those of Helms (1985), Plaut and Pluta (1983), Wasylenko and McGuire (1985), and Papke (1987), found statistically significant links between state economic growth or business start-ups and various measures of public-sector infrastructure spending. The level of precision in these studies does not enable one to reach a conclusion on whether any or all of the spending areas examined return more in business-location creation than would be lost through an equivalent dollar increase in business taxes.

Directions for Further Research

The literature review provided in this report indicates that there are still major gaps in our knowledge of the impacts of taxes on business-

location decisions. Little formal empirical work has been done on Canadian data, and many of the U.S. studies are seriously flawed in the choice of tax measures or the econometric techniques applied.

The few studies on international capital movements do suggest a significant role for corporate income taxes, primarily, although not exclusively, through their impacts on retained earnings. These results appear to conflict somewhat with the micro-economic theory of the multinational enterprise, which suggests a greater degree of financial control from the centre rather than a strong link between investment in any one country and historical cash flows in that country. Further studies should be conducted on this data to test the sensitivity of the existing work to alternative specifications and time periods studied. Important improvements could be made to the existing literature on FDI into Canada, including the use of marginal as opposed to average tax rates and the incorporation of the complexities in the impacts of home- and host-country tax policies.

The survey literature has some important gaps from the perspective of current Ontario policy development. The few Canadian studies have not isolated the potentially different decision-making process of U.S. and Canadian multinationals from those of other types of firms. Little is really known about the factors that have motivated the recently observed outflow of manufacturing activity from Ontario, for example. We understand that the federal government is considering undertaking such survey research in the near future, and the Fair Tax Commission may be able to benefit from the findings of this work.

A number of interesting studies have been conducted on U.S. plant location decisions, using establishment-level data. We have not identified any studies that attempt to replicate this work for Canada, or that include Canadian provinces in the analysis. This could be an important step in understanding plant-selection decisions that will affect Ontario in a more open North American market, and the role of tax policy in these decisions.

Notes

The first draft of this paper was prepared by Avery Shenfeld, Principal, Ernst & Young, for the Ontario Fair Tax Commission and completed in October 1992.

1 For a relatively recent review of this literature, see Chirnko 1987.

2 New York, Michigan, Ohio, Tennessee, California, Connecticut, California, Massachusetts, Illinois, and Georgia

3 The sample included firms in food processing, plastic products, furniture, printing and publishing, primary metals, fabricated metals, machinery, transportation equipment, electrical products, chemicals, and "miscellaneous manufacturing."

4 This point was suggested by a reviewer of an earlier draft of this paper.

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